

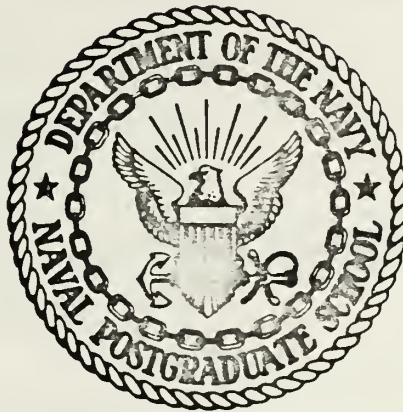
IMPROVING PHYSICIAN ACCEPTANCE  
OF AUTOMATED MULTIPHASIC HEALTH TESTING

Wendell Leo Chappell

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# THESIS

IMPROVING PHYSICIAN ACCEPTANCE  
OF AUTOMATED MULTIPHASIC HEALTH TESTING

by

Wendell Leo Chappell

March 1975

Thesis Advisor:

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Improving Physician Acceptance  
of Automated Multiphasic Health Testing

by

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Submitted in partial fulfillment of the  
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

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## ABSTRACT

This study presents a summary of an extensive literature review on Automated Multiphasic Health Testing (AMHT), concentrating on physician acceptance of the concept. A history of AMHT, a description of the testing process, and a discussion on evaluating physician acceptance of AMHT are provided. An attempt is made to assess the present level of civilian physician acceptance, based on the literature. Several factors which influence physician acceptance are identified and some methods of improving acceptance are proposed. Additionally, the results of a Navy Physician Opinion Survey conducted by the author are given and evaluated in terms of (1) Navy Physician acceptance of AMHT and (2) the hypotheses developed from the findings in the literature. The role of AMHT in the Navy's Health Care Delivery System is examined, considering past utilization and plans for the future. Finally, some concluding observations and predictions are presented.



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## I. INTRODUCTION

### A. GROWTH OF INTEREST AND SUPPORT FOR MULTIPHASIC TESTING

In recent years, multiphasic testing has stimulated considerable interest within a variety of groups both inside and outside the medical profession. This interest has contributed to the growth of multiphasic testing facilities from eighteen facilities in 1959 to over 160 in 1972. The growth rate is predicted to be even greater in the future, reaching 1,800 testing facilities by 1980. [Medical World New, October, 1970.]

As multiphasic testing (a battery of laboratory tests and related procedures designed to test a large number of people in a rapid and economical manner), became more prevalent and improved diagnostic instrumentation was interfaced with computers, proponents of the concept began to suggest that it be used as the intake mechanism for providing primary health care. Today many supporters see multiphasic testing as a necessary tool to provide better health services to existing patients and to the presently undoctored population. Supporters suggest that multiphasic testing is the best system yet developed to provide a means of increasing the productivity of preventive health services and greater access to care for more people while adding only minimally to the overall cost of health delivery.



## B. NECESSITY OF PHYSICIAN ACCEPTANCE

If multiphasic testing is to provide the benefits proclaimed by its supporters, the concept must have the acceptance and the support of physicians. Without physicians acceptance, Von Oeyen [1972:366] states, "the screening examination is merely a time consuming, costly, and valueless procedure." Regardless of the amount of precise data the testing system collects, it is the physician who makes the final diagnosis and decides what treatment is indicated. Therefore, acceptance by the medical profession is essential if the concept is to reach its full potential.

## C. OBJECTIVES AND DEVELOPMENT OF THESIS

The objectives of this thesis are to evaluate the literature and the results of the Navy Physician Opinion Survey conducted by the author in an attempt to assess the present level of Navy and civilian physician acceptance of multiphasic testing, identify factors which influence their acceptance of the concept, and suggest methods to increase physician acceptance. Additionally, an attempt is made to evaluate the role of multiphasic testing in the Navy Health Care Delivery System.

The development and presentation of this thesis is made in nine sections. Section II provides a description of multiphasic testing, a review of its historical development, the types and scope of present facilities, the major categories of use, and the objectives of a testing program. Section III discusses the necessity of physician acceptance, the difficulties involved in assessing the level of acceptance, and some factors which influence acceptance. Section IV attempts



to evaluate the present level of acceptance, in terms of organization acceptance, individual physician acceptance, and physician acceptance in other countries. Section V presents some suggested methods of improving physician acceptance, including: medical school involvement, a program of indoctrination and continuing education for practicing physicians, and providing for more physician involvement in testing programs. Additionally, an attempt is made to show that managers of testing facilities, and their performance in carrying out the functions of management, can be a great influential factor in increasing physician acceptance.

Section VI discusses the Navy Physician Opinion Survey conducted by the author and attempts to relate the survey findings to the literature evaluation. In Section VII, the role of multiphasic testing in the Navy's Health Care Delivery System is discussed in terms of: (1) potential contribution, (2) studies and utilization to date, and (3) official plans for the near future.

Section VIII comments on the future of multiphasic testing in general and present some predictions on the changing role of multiphasic testing. Finally, Section IX presents some concluding observations concerning multiphasic testing in both military and civilian sectors.



## II. AUTOMATED MULTIPHASIC HEALTH TESTING DESCRIBED

The objective of this section is to assist the reader in understanding the concept of multiphasic testing. With this in mind, an attempt is made to define the concept, show its historical development, identify some of the types and scope of present facilities, and present the major objectives of a testing program.

### A. DEFINITION AND DEVELOPMENT OF THE CONCEPT

Multiphasic testing is a term which has evolved to describe a programmed processing of physical examinations by using a selected group of test and diagnostic type instruments. These groups of tests, called batteries, consist of several disease detection procedures which have been consolidated into a programmed system that allows rapid processing of large groups of people. One might say that multiphasic testing is a comprehensive series of medical tests which seeks to screen and detect a disease before it becomes obvious to the patient, as well as a series of medical tests which can provide physicians with detailed standardized information on patients who already have symptoms.

Although multiphasic testing is considered to be a relatively new concept in medicine, the idea of using selected tests for a large group of patients dates back to the Civil War. The concept seems to have had its origin in an extension of the idea of routine screening tests such as the serologic test for syphilis and urine test for diabetes. When more than







one test began to be included in the screening process, the term "multiphasic screening" was born. With further development of laboratory and data processing technology, and as the screening process took on the aspect of a planned and organized sequence of steps, the term "automated multiphasic screening" began to be used. When computer programming techniques became more sophisticated, the process began to be used beyond what was considered mere screening. In this type application, the screening program not only collected several items of disease indicating data, but provided the data in a print-out which compared the test results to established normal values. Furthermore, some computers were programmed to indicate the probability of a certain disease or condition being present, based on the analysis of the test results. With these developments, the term "automated multiphasic testing" was coined. [Hsieh, 1971:12.]

The use of the terms -- multiphasic screening, automated multiphasic screening, automated multiphasic testing, and automated multiphasic health testing -- to describe the same process, has led to some confusion. Consequently, according to Watts [1970:3], much time has been spent in an attempt to develop a precise definition for each term. Yet, there are still about as many definitions as there are knowledgeable people in the field. To keep from adding to the confusion, the term "automated multiphasic health testing" (the term most widely used in the current literature) will be used throughout this thesis. In most instances the abbreviated form, AMHT, will be used.



## B. TYPES AND SCOPE OF PRESENT TESTING FACILITIES

Although the battery of tests performed varies from one testing center to another, the procedures most often mentioned in the literature include a medical history and varying number of the following tests: (1) height and weight; (2) temperature, pulse, respiration; (3) skin fold; (4) achilles tendon reflex; (5) blood pressure; (6) electrocardiogram; (7) spirometry; (8) visual acuity, (9) tonometry; (10) audiometry; (11) chest x-ray; (12) mammography; (13) pap smear; (14) blood chemistry; (15) hematology; and (16) urinalysis. Some centers routinely perform proctoscopic examinations, others do not perform them at all. While some centers are on-line with a computer from the time a patient comes to the facility until he departs, other facilities send their test results to a distant location to be accumulated and compiled. In most cases a print-out of test results and comparative normal ranges are forwarded to the patient's personal physician. ["A Review...", Hospitals, 1971:75-87].

A typical hospital AMHT facility would be similar to the system installed at the Wyandatte General Hospital, Wyandatte, Michigan. This system was designed to provide the following:

A detailed patient health profile at the time of admission.

A reduction of needless bed occupancy by processing patient test more efficiently and rapidly.

A system to assist the physician in identification and classification of patients in terms of those who are sick and those who are relatively well.



A detailed record of the multitest process, including the patient's history, in a uniform format.

A system for early detection of abnormalities before symptoms appear.

A system for storing health data for statistical studies and research aimed at improving care and reducing cost.

[Oszustowicz, 1972:81.]

Perhaps the best known AMHT center, inasmuch as it has received the most attention in the literature, is the facility operated by the Kaiser Foundation, Oakland, California. An on-site visit to the Kaiser Facility revealed that although a computer is utilized, it is not on-line with the testing devices. Input to the computer is made by means of punch cards which are hand punched at each testing station.

Interest in the Kaiser Facility led the U.S. Public Health Service to fund experimental testing units (using large multi-purpose computers on-line with the testing devices) in New Orleans, New York City, Providence, and Milwaukee. Today AMHT units are set up in: (1) short term community general hospitals, (2) hospitals affiliated with universities and medical schools, (3) group practices, (4) individual medical practices, (5) private clinics and health testing centers, (6) industrial medical centers, (7) private medical foundations, (8) commercial laboratories, (9) governmental institutions, and (10) mobile satellite facilities. [Searle Medidata, Inc., 1974: 5-12.] These facilities tested approximately two million people in 1971.



The American Medical Association reports that as of 1972, there were 140 known AMHT facilities in the United States and that several more facilities were in the planning stage. The heaviest concentration of facilities are in California (24 facilities), New York (18 facilities), and Michigan (11 facilities). The growth of AMHT facilities is indicated in Table I, page 15, while types of operators are shown in Table II.

The type and operational techniques of the facilities are quite varied. Eighty-two managers reported that they operate facilities at single locations, while twenty-eight reported operating at multiple locations. Twenty-seven reported that they operate mobile units. Furthermore, large variations exist between the different AMHT programs -- from a fixed standardized battery of test, to variable test that can be selected by the physician for different type patients. [AMA, 1972:2.]

AMHT has not been only an American innovation, for testing facilities are being developed throughout the world. Facilities presently described in the literature include those in Canada, England, Australia, Japan, Germany, and Poland.

McElroy [1972:7-13] describes a private company, Medical Data Science Limited, which operates AMHT facilities at 40 separate locations in the Province of Ontario, Canada. Although privately owned, the facilities operate within Canada's prepaid medical system, providing testing for 50,000 ambulatory patients and 5,000 non-ambulatory patients per month. This includes service to over 200 hospitals and pre-employment testing







TABLE I

<u>Year</u>	<u>Number of Facilities</u>
1914	1
1940	6
1959	18
1969	70
1970	96
1971	140

[AMA, 1972:2.]

Medical World News estimates there will be 1,800 facilities by 1980.

TABLE II

<u>Type Operator</u>	<u>Number of Facilities Operated</u>
Private Corporations-----	39
Federal, State, and Local Governments-----	29
Hospitals-----	20
Private and Group Practices-----	7
Insurance Companies-----	5
Professional Organizations-----	7
Clinical and Service Laboratories-----	3
Medical Societies-----	1
Labor Unions-----	1
Others-----	28

[AMA, 1972:3.]



for 100 Canadian-based corporations. Stat results are available to the referring physician within two hours, abnormal results the same day, and normal results are reported within 48 hours. The reporting is accomplished by means of telephone or teletype to distant locations, followed by a hard copy report through the mail. In addition to the normal battery of tests given to all patients, customized tests related to industrial type diseases, e.g., enzyme pollution, heavy metal poison, etc., are available upon request. A Hewlett Packard system is used in calculating the testing results, while an IBM 360/85 system is used for billing, budgeting, and other management applications. Patient records are maintained on microfilm for five years. Overall, the company states that a savings of 15% is realized by the automated system when compared to the previous manual method.

Another example of a foreign, private corporation AMHT facility is the Deutsche Klinik for Diagnostik (German Diagnostic Clinic) [Giere *et. al.*, 1972:35-44]. This clinic uses its data processing capability to control patient flow; acquire medical histories and patient data; perform and record laboratory procedures; and assist in administration and research. A unique feature of this clinic is that patients are allowed to come in for testing on their own initiative, without having to be referred by a physician. The findings are explained to the patient by the facility's physicians. In case of abnormal results, the patient is advised to see a specific type specialist for treatment and follow-up.

A system that has been adapted to meet the needs of the Japanese culture is described by Kobayoshi [Kobatoshi *et. al.*,



1972:26-34]. The system, designed by the Tokyo Shibaura (Toshiba) Company, is installed at the Toshiba Central Hospital, and provides health testing and follow-up studies for the 115,000 employees (and their families) of the Toshiba Electric Company. Test results for sixteen tests are fed into a computer on Optical Mark Reader (OMR) cards. The most commonly detected diseases have been hypertension, gastritis, and diabetes mellitus. By utilizing automated devices, interfaced with a computer, and having a physician at the end of the screening process, the program sponsors feel that they realize a substantial savings over the previous method of admitting the patient to the company hospital for the same tests. [Kobayoshi *et. al.*, 1972:34.]

The Toshiba facility was designed by inhouse personnel with the aid of computer companies, as was most of the early American facilities. The majority of recently installed systems, however, have been built by one of the following companies that specialize in the installation of a package system: "(1) Searle Medidata, Inc., (2) Mediquip Corporation, (3) Pelam, Inc., (4) Automated Multitest Medical Laboratories or (5) The General Diagnostics Division of Warner Lambert Company, which specializes in mobile units." [Spencer, 1970: 16-17.]

#### C. MAJOR CATEGORIES OF USE FOR MULTIPHASIC TESTING

Although there are differences from facility to facility and country to country, AMHT is used for similar purposes at all facilities. Sanazaro [1971:41-42] summarizes the major categories of use as:



(a) Fitness examination: This includes examination performed to determine fitness for employment or continued employment, entry into schools, and entry into the military service. Also included are periodic re-examinations, and other examinations, e.g., life insurance physicals.

(b) Health assessment, screening and disease detection examinations: This includes the periodic examination of asymptomatic persons who may or may not be considered a "patient," the screening of patients considered to be in a high risk group, and surveying a general population to determine health needs.

(c) Adjuncts to diagnosis: This includes examinations that assist in making a diagnosis upon admission to a hospital, a nursing home or as a part of a routine office visit. Additionally, the testing procedure can be used to compile data on a patient who is under the continuing care of a physician for an undiagnosed acute illness or complaint.

(d) Patient surveillance: This includes monitoring the status of patients with a known chronic, acute or remittent illness.

(e) Adjuncts to patient management: This includes instructing patients in the self-care that they should render to themselves. This type use can be designed to overcome communication barriers between physician and patient due to time, language or cultural differences.

#### D. OBJECTIVES OF A TESTING PROGRAM

Hsieh [1971:12-20] suggests that the objectives of AMHT are: (1) to uncover previously unknown conditions; (2) to





re-identify previously known, but presently untreated diseases or conditions; (3) to refer patients with discovered indications of diseases to further diagnostic or treatment services; (4) to coordinate with physicians the follow-up of referred patients; (5) to demonstrate better utilization of resources in the delivery of health services; (7) to utilize automation to rapidly and accurately collect, collate, and retrieve health-record information; (8) to reduce patient waiting time; (9) to save the valuable time of health care professionals; (10) to process information on many patients in a short time period; (11) to provide more accurate detection of abnormal values, by comparing the test values with normal values stored in a computer; (12) to develop a base for epidemiologic study of chronic disease; and (13) the substitution of potentially less costly preventive methods now for the treatment of established diseases later.

There is an increasing number of supporters who suggest that AMHT can provide a useful means of entry into the medical care system, allowing entrance for many of the presently undoctored population. Arguments supporting this idea are based on such statements as: "While the United States has been a world leader in developing highly sophisticated treatments for rare and difficult diseases, large segments of her people are unable to obtain care for the common everyday run of the mill diseases." [Banks, 1971:1.] Banks suggests that part of this problem is due to physicians finding no glamor in treating such ailments as moderate hypertension, mild diabetes, and common upper respiratory infections. Furthermore, most



physicians are not "turned on" by preventive measures such as annual physical examinations. Banks [1971:1] goes so far as to say that, "It is unfortunate but true that the practice of primary medicine often appears to the physician to be dull, common place, humdrum work." [Banks, 1971:2.] By using AMHT to relieve the physician of the repetitive and boring task of primary care, he would be able to devote his time, talents, and training to problem cases.

AMHT has undergone many changes since its conception. Improved detection procedures continue to be made. The suggested uses and objectives of testing programs continue to grow. Whether the process will become more diagnostic in nature or will be limited to screening out people who should undergo diagnostic procedures remains to be seen. The direction that it will take will depend primarily on one basic factor -- the degree of physician acceptance of the concept.



### III. EVALUATING PHYSICIAN ACCEPTANCE

The purpose of this section is to show the necessity of physician acceptance of AMHT, to identify the difficulties involved in attempting to evaluate this level of acceptance, and to discuss some of the factors which influence physician acceptance.

All AMHT facilities have one common denominator: a physician must review the output before any decision is made on the examinee's state of health. Therefore, physicians must accept the concept of AMHT before they will make use of the testing reports. The American Medical Association, (AMA), [1972:6] states that the success of AMHT is dependent on three factors: (1) the scientific and technological development and perfection of a useful, reliable array of test examinations; (2) a public which is motivated to undergo a series of examinations which it might consider expensive, time consuming and possibly impersonal; and (3) most importantly, physicians who are motivated to accept and verify the findings of test results and to treat and follow-up patients which the testing process detects as having abnormalities. Furthermore, the AMA has suggested that without physician acceptance, AMHT is an incomplete and ineffective health service.

#### A. DIFFICULTIES ENCOUNTERED IN EVALUATING PHYSICIAN ACCEPTANCE

When attempting to evaluate the level of physician acceptance of AMHT, one is faced with several difficulties, e.g.,



lack of scientific research in this area, the biases of the few researchers and writers who have evaluated physician acceptance, and the validity of survey results, to name a few. Although a multitude of articles have been written about AMHT, most of them have been of a general descriptive nature. An indication of the lack of literature on physician acceptance was noted by this writer when reviewing a 175 page annotated bibliography of AMHT articles written since 1963 (H.E.W. Publication No. 2076). Of the 463 abstracts presented in this reference, only two discuss physician acceptance. This lack of literature on physician acceptance is also pointed out by Startzman and Robinson [1972:219] who state, "the literature on the expression of the physician's opinion towards computers (and AMHT) is less than abundant." Furthermore, most of what has been written has been relegated to off-the-cuff remarks that occurred during presentations at scientific meetings. Those statements which have been documented are often in conflict. Examples which Startzman and Robinson [1972:219] use to point out this conflict are the following statements: "The climate for accepting computer applications in clinical medicine is favorable among the physician polled," and "many have resisted even the beginning automation." Rawson [1972:497-504] -- after studying numerous articles on AMHT by Adams, Garfield, Collen, Gelman, and others -- also conclude that there is a disproportionate number of conflicting findings in the literature, specifically on physician acceptance and economic benefits.

Another problem is that the personal experience and the bias of investigators seem to be the basis for a large amount of both







support and opposition to AMHT. Supporters claim to have sufficient evidence to justify their support. Opponents direct a variety of criticism including the idea of preventive examinations in general, the usefulness of individual tests, the danger of overwhelming the busy physician with trivial abnormalities, and the imperfection of automated procedures.

The lack of a standard terminology is also a complicating factor when attempting to evaluate acceptance. Currently the terminology, multiphasic screening, multiphasic testing, automated multiphasic screening/testing, and automated multiphasic health testing are used interchangeably. To some physicians, two tests fit the definition, while to others there must be several tests. Thus, in answering the same questions, the physicians may be responding to different ideas of how many and what kind of test are involved. Some facilities use physician supervision extensively, others do not use physicians at all. Consequently, an interviewee who may base much of his answer on the degree of physician involvement has no way of knowing the degree of involvement unless specifically brought out in the interview.

Another factor which must be considered is the methodology used in conducting the survey. Some articles declare that there is a high level of acceptance, while others say that there is a low level. Yet, most of these articles do not provide the methodology used to reach these conclusions. Furthermore, surveys only describe what physicians say they do, not what they actually do. In this regard, Bates and Mulinare [1970:2179] point out a study by Detuscher which "...emphasized



the frequent discrepancies between words and deeds." This discrepancy is supported by studies conducted at Stanford University Hospital and at the Kaiser Permanente Medical Group, Oakland. The results of the two studies were compared by Medical World News [March, 1972:59] in an attempt to evaluate physicians' stated versus actual use of the data received from testing programs. At Stanford University Hospital 547 patient records were compared with the data provided by the computer in the testing programs. The 547 selected records belonged to patients whose physicians had openly supported the screening program and had referred the patients to the AMHT facility for "diagnostic assistance." The findings showed that where one or more abnormal values had been listed for the twelve available laboratory tests, the physicians tended to consider the values as clinically insignificant or had not entered any interpretation in the record. In most of the cases examined, no specific diagnosis resulted during the year that followed the first workup. Moreover, "...the extent of the deviation from the norm of lab test had no relation whatever to the likelihood that a diagnosis was entered on the record. Seemingly, both ambiguous and pronounced deviations were accepted or rejected indiscriminately." [Medical World News, March, 1972:59.]

By contrast, the study at the Kaiser facility showed that where the number of abnormal findings given to the physicians increased, there was a disproportionate increase in the number of additional tests, follow-up procedures, referrals, prescriptions, and new diagnoses.



## B. FACTORS INFLUENCING PHYSICIANS ACCEPTANCE

### 1. General Factors

The first step in attempting to evaluate the level of physician acceptance of AMHT was to try to identify some factors which cause physicians to accept or reject the concept. David Mechanic [1970:239-241], in his evaluation of physician acceptance of AMHT, has indicated that acceptance does depend on several distinct and identifiable factors: three of the major ones being the financing, the organization, and the control of the testing facility. Therefore, it is possible that the factors affecting physician acceptance of a AMHT program organized within a group practice with a prepaid enrollment may be different factors than those at a facility that provides support to private practice physicians. Furthermore, Mechanic says, "that acceptance is also likely to depend on the nature of the contracts between the testing facility and the physicians, such as how the physicians are approached, the scope of the explanation to physicians concerning the program, and the modes of communication utilized." [Mechanic, 1970:240.]

Since there are many differences in existing facilities, findings from the evaluation of one program cannot necessarily be generalized to other programs. Therefore, even though the literature suggests that there are some factors which provide valid indicators of physician acceptance, all conclusions must be considered within the context of the screening system from which the data was collected. Even so, on a nationwide basis, physicians' views of AMHT appear to depend on their perception





of its usefulness and validity, and on their particular orientation to preventive medicine and health testing. Their cooperativeness appears to depend on how they see a program as a threat to their practice, the requirement for changing their procedures of practice, new effort required, and their perception of how AMHT will affect their incomes. [Mechanic, 1970: 240.]

Physicians are likely to be exposed to contradictory views concerning AMHT, therefore, much of their cooperation and acceptance may depend on the attitudes of their colleagues and the local informal medical network. An endorsement by a prestigious medical group is likely to have favorable impact. Freeborn and Darsky [1974:11], in their study of the power structure within a medical community, concludes that overall physician influence is related primarily to control of institutional resources, e.g., the hospitals and local medical society. Top officials in these institutions, through their control of the major resources in the medical community, appear to have the potential to exercise power over the non-influential physicians across professional, political and economic spheres of the profession. Thus, the acceptance of AMHT by the medical community's leaders is probably essential for a successful AMHT program. Physicians may also be influenced by their patients attitudes towards AMHT and are more likely to cooperate if they feel that their patients expect them to do so. [Mechanic, 1970:241.]

Data collected in various Department of Health, Education and Welfare studies [H.E.W. Provisional Guidelines, Vol.





3, 1970] suggest that physicians initial attitudes are less important than the kinds of inducements and accommodations made with a newly enacted program. Acceptance is more likely to be induced by a program which is explained carefully, which makes clear the nature of the information provided to physicians, and that presents the physician with objective information that is easy to understand with limited effort. The physician must be able to see that the system has been designed to aid him, his patients, and, at the same time, save money for his patients.

## 2. Legal and Ethical Considerations

The rapid increase in the number of AMHT programs during the past few years has brought a new factor affecting physicians' acceptance to light. Because many of the programs accept and test persons who have not been referred by a physician, the legal implications of unsolicited reports must be considered. Generally, the programs that accept unreferred patients ask them to designate a physician to whom the report is to be sent. As a result, reports have been sent to practicing physicians without any advance notice or arrangement made by the person tested regarding the service involved in evaluating the reports. When an individual requests that the report be sent to a specific physician, he is requesting the performance of a service by that physician. "The extent to which a physician is obligated, if at all, to furnish such service, involves legal questions for which neither the courts nor state legislatures thus far have provided answers. There are also humanitarian implications." [AMA, 1972:9.]



In recognizing that many physicians might be concerned over the legal considerations, the AMA [1972:9-10] has provided recommendations to physicians for handling unsolicited AMHT reports. These recommendations cover the legal and ethical aspects of the reports and the physician-patient relationship, as shown in Appendix A.

#### C. FACTORS INFLUENCING PHYSICIAN REJECTION

Although most physicians accept the fact that technology can expand their services, relieve health manpower shortages, spread services to persons previously not covered, and provide these services at a lower cost, Watson [1969:460] suggests some of the factors preventing full physician acceptance are: "(1) compliance of the patient in following advice, (2) the use of unaided technicians as a substitute for periodic health examinations by a physician, and (3) the differentiation between screening for preventive case findings and screening as a diagnostic aid."

A discussion of the factors that led to early rejection of AMHT was found in an article written by Dr. W. G. Smillie, a professor of preventive medicine at Cornell University Medical School [Smillie, 1952:255-258]. Smillie reported that many of his colleagues found the disadvantage of AMHT to be: (1) the screening is done by technicians, and a doctor is not consulted until the patient has been completely screened, (2) most people are not willing to pay for multiphasic screening and (3) the individual should go first to the physician, not to a health center for screening."



Smillie further suggested that many physicians (in 1952) were against the whole premise of AMHT because it operated under the assumption that "without knowledge of the past history of the patient, with no information on his heredity, his constitutional make up, his mental or emotional characteristics, or his past illness, the series of tests will separate the sick from the well." Smillie conceded, however, that the tests were simple and inexpensive and that they were effective in discovering asymptomatic chronic disease (selecting 40 to 50 persons in each 1,000 who have a disease while giving the other 950 a clean bill of health). He further granted that physicians accept the fact that preventive medicine is within the sphere of public health. Even so he opposed AMHT inasmuch as "it was inferior medicine, poor medicine, shipshod, short cur medicine, and furthermore, poor public health." [Smillie, 1952:257.]

Smillie went on to say that many physicians believed that AMHT caused the physician to be "relegated to the role of a technician and that patients were treated like machines on an assembly line." He concluded his article with an attack on AMHT by saying "that chronic disease must depend on such an intimate knowledge of the patient as only a physician can have." He suggested that funds for AMHT be diverted to health education"...to motivate the public to see their physician for a physical examination."

From the evidence presented, an evaluation of physician acceptance is not a clear cut, simple procedure. One must consider all the factors that affect the individual physician's



perception of AMHT. Furthermore, if the evaluation is made from the literature, the objectivity and critical insight of the authors must also be considered.





#### IV. PRESENT LEVEL OF PHYSICIAN ACCEPTANCE

##### A. ORGANIZATIONAL ACCEPTANCE AND SUPPORT

As stated in Section III, a physician is likely to be influenced by the opinions of prestigious medical groups. Furthermore, organizational acceptance is probably a necessity if AMHT is to be accepted by the majority of physicians. Therefore, a good starting point in attempting to determine the level of physician acceptance of AMHT should be to evaluate its acceptance by physician organizations.

In 1950, the executive director of the American Hospital Association suggested that, "hospitals should include multiphasic screening clinics as part of their services." [Sanazaro, 1971:41.] No evidence was found, in the author's survey of the literature, to indicate other organizational support until 1968. At this time, automated multiphasic health testing gained official acceptance by the American Association of Medical Clinics. The extent of the Association's support was the delegates voting to go on record as accepting AMHT as a valid and useful concept. [Group Practice, March, 1970:7-9.]

Also in 1968, the American Society of Internal Medicine, the College of American Pathologists, the American College of Radiology, and the Academy of General Practice jointly expressed interest in combining forces to develop a National Program of AMHT [McWhorter, 1968:34]. Although no evidence was found of any action taken thus far, it is believed that this interest was a significant step towards promoting physician acceptance.



This belief is based on the premise that the four associations' membership is composed of a large number of physicians. If the associations support the concept in their official publications, they are likely to have a favorable influence on many physicians.

In 1970 the American Public Health Association went on record as accepting AMHT. However, the association suggested that the concept, at that point in time, was still basically a promising technique which required further experimentation and controlled evaluation to fully identify its benefits, limitations, and ultimate potential. [Gelman, 1970:362.]

Perhaps the most influencing organizational support came in August 1972 when the American Medical Association's Judicial Council issued its Guidelines for Automated Multiphasic Health Testing Programs. [Medical World News: October, 1972:53.] This report, which encouraged establishing testing centers, led the AMA's Council on Medical Services to issue a similar report in support of AMHT. The report of the Council on Medical Services was adopted by the House of Delegates and was published as the AMA's official Statement on Multiphasic Testing. The position statement provides: (1) supporting statements and opinions, (2) twelve guidelines for physicians and medical societies involved in providing technical advice and assistance in the planning, development, implementation or operation of multiphasic testing programs, and (3) legal, ethical and other factors to be considered. (See Appendix A for a summary of the AMA's position on AMHT.)



A foreign medical organization, the Australian Medical Association, has also issued supporting statements for AMHT. The association contended that although there were some within its body who had doubts about the values of AMHT, the concept could be a means of extending the frontiers of medical knowledge through the computerization of results. However, the association stated that first there must be adequate education of the medical profession so that they would not ignore, but correctly evaluate the results of AMHT. The Australian group went on to recommend that only a limited number of private, profit-making multiphasic testing facilities should be allowed to enter the field until the concept has been fully assessed. This recommendation was not a slur at AMHT, but "was designed to protect the public from unscrupulous and commercially minded men and organizations who are interested in profits only and who do not possess the ethical standards of the medical profession." [Hecker: 1972:495.]

These examples suggest that there is considerable official recognition by medical associations. However, organizational support must be more than just a statement that the concept has merit. Some organizations are providing more than just a stated support of AMHT. One such organization is the Industrial Medical Association which frequently publishes articles on AMHT in its official publication, The Journal of Occupational Medicine, (JOM). [Tabershaw, 1972:433.] In an introduction to the June 1972 special issue of JOM, Doctor I. R. Tabershaw (managing editor) stated that the issue was provided to enlighten occupational physicians who did not have a full understanding of the concept.





Other organization support goes beyond providing information and recommendations to its members. These organizations are working to get their members involved with testing programs. This type support is perhaps where the greatest organizational influence on physician acceptance can be made. An example of how this involvement can help raise physician acceptance is a project conducted by the Medical Society of the County of Kings, Brooklyn, New York. The project was initiated specifically to provide a means of studying physician attitudes towards AMHT. By offering its physician members the opportunity to receive a free multiphasic testing examination twice annually, the society hoped to evaluate the effect that participation would have on acceptance. Of the 210 physicians who registered to take the examination, 206 showed up for testing. Prior to participating in the project, 73% of the tested physicians had stated that the battery of tests was appropriate. After testing this figure increased to 92%. Ninety-three percent indicated that they would participate in the program again, while 59% reported that they planned to refer their patients to the testing center, "on the basis of their own experience." [Gitman, 1971:63-68.]

#### B. INDIVIDUAL PHYSICIAN ACCEPTANCE

Since the major national physician's organizations appear to accept and support AMHT, one would expect to find a high level of physician acceptance. However, there is a much more important factor that must be evaluated -- acceptance by physicians as individuals. The ultimate decision as to what





treatment a patient will receive is made by the patient's physician. This decision is based on the physician's training, his experience and his conscience. Even though the decision may be influenced by the adopted standards of treatment of his peers, it is his own decision. A group can recommend methods to improve patient care, but they cannot force the individual physician to accept and use them. Therefore, if AMHT is to fill the role outlined by its supporters, it must be accepted by a majority of physicians as individuals.

To the best of this writer's knowledge, there has not been an attempt to assess the total physician community's acceptance of AHMT. Available studies have been restricted to a given testing facility or to a limited geographical area. Therefore, any assumptions made on the degree of total physician acceptance must be made on limited, questionable data. However, if evaluated in the proper manner, the limited data should give an indication of trends in physician acceptance. Several summaries of opinions and studies are now presented for comparison.

According to Dr. Joseph C. Barbaccia, associate professor of Community Medicine and Director of Health Services Research at the University of California in San Francisco, some 5% to 10% of physicians have become enthusiastic supporters of AMHT. Another 50% regard it as a useful tool. "The remaining physicians oppose it as a concept that endangers the practice of traditional, Oslerian medicine." [Medical World News, October, 1972:51.] However, even in the group that opposes the concept, Barbaccia suggests that a large number would use 25% to 30% of the data generated by a testing facility. Dr. Barbaccia contends



that many of those who oppose the concept do so because they lack the training to cope with the mass of data that is generated. Dr. Everret Joslyn, Jr., agrees somewhat with Dr. Barbaccia's reason for rejection, but says, "...even younger physicians, trained to read and interpret print-outs, are bound to be confused by the variations in reports produced at different data centers." [Medical World News, October, 1972:51.]

Gitman [1971:63-68] reports that staff physician reaction to the testing programs at Brookdale Hospital, Brooklyn, New York, ranges from enthusiastic approval to vehement rejection, with the largest number falling somewhere between the two extremes. He attributes the variance in reaction to the individual physician's opinion of "the hospital in the practice of medicine, town-grown competition, government in medicine, machines in medicine and the economic threat of testing programs, rather than the physicians opinion of the medical information offered." [Gitman, 1971:68.]

Chapman [1970:42-43] states that physicians who control the automated Multitest Medical Laboratories, Inc. (AML), Palo Alto, California are quite confident that the facility will win wide acceptance of area physicians. The facility operates as an independent unit with services equally available to all physicians in the community. Initial reaction from physicians in the area suggests an apparent willingness to use the testing service, yet only a small percentage are now using the facility.

Khoury [1972:664-668] reports on a project which indicated the level of physician acceptance in Washington, D. C. During



1968 and 1969, 20,945 persons were tested by a District of Columbia community health multiphasic unit. Eleven free tests were offered to the general public. The program was advertised through newspapers, television, radio, civic groups, churches and other organizations. Local physicians were asked to refer patients to the facilities both by media advertisement and through the local medical society. Yet, only 325 of the 20,945 persons tested were referred by a private physician. The following findings were noted during the testing program: (1) diabetes -- 1,850; (2) anemia -- 740; (3) glaucoma -- 198; (4) hypertensive disease -- 1,850; (5) heart disease -- 1,462; (6) circulatory system disease -- 1,090; (7) tuberculosis -- 16; and (8) other respiratory disease -- 833. Although no attempt was made to measure the action taken by physicians who were sent positive results, the testers concluded, "that private physician acceptance of the community screening program was extremely low." [Khoury, 1972:668.]

An opinion of physician acceptance on a national basis is offered by Dr. Sidney Garfield of the Kaiser Foundation. He says that, "the majority of physicians welcome multiphasic screening," [Garfield, 1970:1088]. Garfield based this statement on the following reasons: (1) the spreading concept of medical care as a right, with its elimination of fees for service is creating a large demand for periodic health examinations which cannot be met by traditional methods, and (2) multiphasic testing can separate the entry mix of patients into the well, the asymptomatic sick and the sick; making





possible the optimum use of physician service which can be devoted to the area where they are most needed -- the care of the sick. [Garfield, 1970:1088.]

A different opinion is given by Dr. Otto Page, president of the American Society of Internal Medicine. Speaking for himself and not the society, Page says that "multiphasic techniques were supposed to be time savers; instead, in some cases they can increase the physician workload." [Medical World News, October, 1972:51.] Doctor Page cites examples of physicians and patients spending a lot of time and money evaluating borderline findings, e.g., calcium readings. He also suggests that testing can breed over-confidence in some people: "A man may ignore chest pains, for instance, if he has recently been screened and found okay." [Medical World News, October, 1972:51.]

The conflicting statements on the level of physician acceptance presented in this section thus far are merely opinions expressed by various writers. They did not reference any studies to support their opinions, nor did they discuss how they arrived at these opinions. Therefore, they must be accepted as what they are -- personal opinions.

There have been some formal studies conducted to assess the level of physician acceptance. One of the most significant ones (since the researchers' objective was to select a research methodology designed to eliminate researcher bias) was conducted by Bates and Mulinare [1970:2173-2180]. After compiling a list of all internists and general practitioners in a 10 county area of upstate New York, Bates and Mulinare interviewed a random





sample of 202 physicians on the list. One objective of the interview was to determine the physicians' opinions of twenty-four screening test for patients in the age range of 40-65 years. The Chi-square test, with Yates Correction, was used to determine if there was any significant relationship both between physician testing practice and their specialty and between their testing practice and community size. It was found that medical specialty (internist vs. general practitioner) and community size apparently have little influence on present testing practices, except for three tests -- tonometry, stools for occult blood, and hemoglobin.

Practice patterns at the time of the Bates and Mulinare study ranged from urinalysis done by 97% of the physicians, to mammography done by 1%. A significant proportion reported, that although they did not do many of the tests, they were ideally desirable. Some of the most frequently cited reasons for not using the ideally desired test were: "(1) patient expense, (2) physician reluctance to use test without clinical indication, (3) lack of office facilities, and (4) amount of physician time and inconvenience." [Bates and Mulinare, 1970: 2176.]

Bates and Mulinare [1970:2177] further indicated that although most of the physicians interviewed agreed that AMHT could solve problems of logistics, office space, and expense, physician reliance on clinical indications and their fear of losing medical control would reduce utilization. Of the 91% of physicians responding to a post interview mail-in questionnaire, one-fourth were in favor of a AMHT, one-fourth responded negatively



and one-half had mixed reactions. Two predominate themes found in the negative reactions were costs, and the loss of physician control.

Von Oeyen [1972:366-374] describes a study conducted in 1970 at Rhode Island Hospital, Providence, R.I., which suggests that physicians in that area have a favorable attitude towards AMHT. In this study, questionnaires were sent to the 384 active and consulting staff physicians who had access to the hospital's new testing facility. Although only 202 questionnaires (53%) were returned, the researchers considered this a good response rate since the questionnaire was quite extensive in nature. Furthermore, the physicians had not had much prior contact with testing programs.

Seventy-one percent of the responding physicians supported the idea of using AMHT as a means of entry into the medical care system. A large number felt that the best use of AMHT was to reach persons who were not receiving regular care from private physicians; however, they also desired to have the facility available for their private patients. Areas cited as being suited for a testing program were neighborhood health centers, hospital ambulatory care services, and hospital in-patients entry point. The favorable opinions, however, were tempered "by doubts as to the extent the program was actually meeting the Rhode Island people's medical care needs; by concern with interference in the individual physician's role in private practice; and some disagreement in the basic concept of presymptomatic screening." [Von Oeyen, 1972:374.]



A similar type study was conducted by Bates and Yellin [1972:74-78] in the Rochester New York area. To determine the yeild of a AMHT program conducted by the Rochester Regional Medical Program during 1969 and 1970, a questionnaire was sent to 417 physicians who had received positive reports from the testing program. The response rate was 90.9%. In view of the wide range of specialists surveyed and other criteria assigned but not identified by the researchers, a reliability rate of 87.2% was given to the results. The primary findings of the survey was that a large percentage of the physicians failed to confirm or follow-up the findings of the testing unit. In view of this lack of physician acceptance and responsiveness, uncertain effectiveness of therapy, and problems of patient compliance, the researcher concluded that long-term benefits from AMHT in terms of morbidity and mortality are not likely to be demonstrable.

Two additional studies which appear to have been conducted as formal studies, (although the methodology was not stated), are the testing programs of the Tennessee Valley Authority and the California Cannery Workers. The results of a survey of the Tennessee Valley Authority's Physicians showed that 95% of the physicians strongly supported the TVA's testing program. The largest contribution of the testing program was felt to be the mobile unit. In addition to providing examination to employees in isolated areas, the mobile unit has tested over 4,000 rural Appalachian residents. The Medical Staff felt that the mobile unit extended their medical arm to remote locations that would otherwise go without medical care [Craig, 1972: 12-25].





The other study, which provides some insights as to why some physicians accept the AMHT concept, was reported by Yedidia [1971:69-73]. During the summer of 1967 and 1968, 42,000 employees underwent AMHT under the California Cannery workers program. Nearly 50% of these persons made their first entry into medical care as a result of this computerized routine. By 1970 the number of participants had increased to 22,620 yearly.

A follow-up evaluation of the program revealed the following comments from physicians who had participated in the program:

That they now recognized that the computerized entry of patients into the medical care system: (1) gave important clinical information to the physician; (2) did not overburden the physician's office with the nonsick; (3) provided opportunity to implement preventive medicine - long desired, but difficult to accomplish within the constraints of daily practice; (4) did not encroach upon, but in fact supported the physicians professional prerogative; and (5) provided the physician with a set of useful tools (computer print-outs) for the orderly recording and reporting of clinical information, and for billing. [Yedidia, 1971:73.]

Additionally, some of the physicians felt that the computerized methods of entry yielded a bank of information that could be used in future research. In conclusion, it was stated that although a small number of the physicians were skeptical, the largest proportion became supporters of the testing program.

### C. CONFLICTING OPINIONS OF PREVIOUS SURVEY RESULTS

The validity of the conclusions reached in the Bates and Yellin Study was challenged by Feldman and Taller [1973:559-560]. Feldman and Taller stated that the Rochester facility was not a representative model of most testing facilities. Additionally they felt that the stated assessment of physician





acceptance was not valid due to the fact that physician involvement was solicited after the testing, not before. They concluded their challenge by stating that the prediction of a lack of long-term benefits could not be supported in view of the way the Rochester program was conducted.

Another example of contradicting conclusions reached in the same study involves the testing program of the New York Telephone Company. Scott and Frederick [1972:457-461] state that physician acceptance was found to be extremely high and that available evidence suggested that realistic goals were being reached in AMHT. They also stated that the primary issue, i.e., "can a marriage between man and computer be made to work in an industrial medical environment," has been resolved. [Scott and Frederick, 1972:461.] Yet, Collings and three physician associates (Collings *et. al.*, 1972:465] report that physician acceptance of the program has varied widely. They cited cases of physician complaints as to the relevance of the test, noting that young physicians were generally more impressed and cooperative than older physicians. In conclusion, they suggested that, overall, the medical community has reacted favorably to the program, but that communications between all parties concerned require considerable improvements.

#### D. PHYSICIAN ACCEPTANCE IN OTHER COUNTRIES

Physician acceptance of AMHT is not a problem that is limited to the United States. There is evidence that the level of acceptance varies in other countries as well. Adams [1968: 860-863] states that two testing units in Australia have not



yet proved that the concept justifies the cost of operating the facilities. He rejects AMHT of the general population on the grounds that:

The fundament assumption upon which screening is based is that through the institution of treatment at earliest possible phase in the natural history of a disease, the outcome of the disease can be most favorably modified. The predicament of those of us involved in the clinical approach to preventive medicine is that this assumption has not yet been scientifically verified for the majority of the high-prevalence chronic disease with which we are concerned today.

Apparently many Australian physicians share Adam's opinion of AMHT as there is considerable resistance by local practitioners to becoming involved with the testing concept. This assumption is based on the fact that the two centers are receiving only 10 to 15 patients a day each and that the prerequisite for patient entry into the facilities is referral by outside physicians, [Hecker, 1972:493]. According to Hecker, this utilization rate does not cover the cost of running the centers. He concludes that the low physician acceptance can be attributed to lack of knowledge of the testing concept and the limited professional association support.

The "Medical Data Science Limited" testing facilities in Ontario, Canada have a high degree of acceptance by 60 company physicians, 3,000 referring physicians, 200 hospitals, 100 nursing homes and over 100 corporate medical officers. This high level of acceptance has been attributed to: (1) rapid turn around time of results, (2) professional interpretation of all results and (3) automatic follow-up on all patients tested. [McElroy, 1972:12.]



Initial physician resistance to the testing program at the German Diagnostic Clinic was very strong. The resistance steadily declined and now the concept is well accepted by a majority of physicians in the geographical area of the clinic. [Giere *et. al.*, 1972:42.]

The testing program at the Toshiba Central Hospital has been so well received by physicians and employees that more such systems are planned in Japan. Japanese physicians have stated that, "the chief purpose of modern medicine is to prevent illness, rather than simply to treat disease." [Kobayoshi, *et. al.*, 1972:33-34.] For this reason, they see a health testing system as being essential to meet today's demands.

#### E. ACCEPT/REJECT CONTINUUM

The opinions discussed herein vary quite widely from writer to writer, apparently depending on the writer's perception of the value of AMHT and not on any given factual evidence. The results of similar studies vary from location to location and some contradicting conclusions were reached in the same study. The author, therefore, concludes that some physician attitudes towards AMHT fall into two small groups at each end of the accept/reject continuum, while the majority probably fall somewhere in the middle.



## V. SUGGESTED METHODS OF IMPROVING PHYSICIAN ACCEPTANCE

Even though some of the 140 or so testing facilities presently in operation appear to have gained area physician acceptance, AMHT has substituted technology for manpower to only a limited degree on a nationwide basis. A lack of physician acceptance has been cited as the major reason for this low interface between medicine and technology. In contrast to other industries, the health industry has been slow to apply modern technology for the specific purpose of assisting scarce manpower resources.

If the health industry, the second largest industry in the nation, continues to be viewed by more people as a one-hundred billion dollar a year industry, with labor costs accounting for approximately two thirds of the total; an impetus to substitute technology for medical manpower is inevitable. [H.E.W. Provisional Guidelines, Vol. 3, 1970:265.] AMHT is already being suggested as a means of relieving the physician of the repetitive tasks of providing primary care. If AMHT is to reach the goals set by its supporters, there must be a concentrated effort to raise the level of physician acceptance and get the medical community to devote more effort to adopting medicine to automation and automation to medicine.

"Physicians have cherished their ability to learn and retain large numbers of facts, to formulate a differential diagnosis and to carry on decision-making activities." [Schwartz, 1970:1258.] Thus, it is quite possible that some physicians







may see AMHT as a devaluation of their hard won medical education and as undermining their intellectual contribution to medical care. They might see the extended use of computers as a loss of status that would have serious social, economic, and political consequences on their profession: a profession that has historically enjoyed eminence in the mind of the public.

This possible rejection of AMHT by physicians should not come as an unexpected phenomenon. Modern management theory holds that people have a built-in resistance to change.<sup>1</sup> To overcome this resistance, those who will be involved in innovative changes must be shown the advantages of the proposed changes. They should be given a chance to express their views and asks questions before the changes are made, not after. The behavioral scientists tell us that people are more likely to accept and support a change that they understand and have a part in developing, than one that is forced upon them. Physicians, then, should be more likely to cooperate with a testing program if they are treated with consideration and if they feel that their participation is desired by management.

Although not expressed in terms of overcoming resistance to change, the need to take action to gain physician acceptance

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<sup>1</sup>See Dale S. Beach, "Understanding People" in Personnel: The Management of People at Work (1970), 2nd ed., p. 441-465 and Harold Koontz and Cyril O'Donnel Principles of Managerial Functions, 5th ed., (1972) for a discussion on how to overcome the "resistance to change."



of AMHT has been recognized for some time. Fourteen years ago Breslow [1959:54] predicted that the expanding population would be faced with an inadequate supply of physicians for a long time to come. Thus, he concluded, the country's well-being would depend on extending the services of every physician by developing ever more intricate testing devices to be used with AMHT. He warned, however, that the success of AMHT as a health service would hinge upon the support of the medical profession.

#### A. MEDICAL SCHOOL INVOLVEMENT

Breslow [1959:56] suggested that medical schools should be the point at which the effort to gain physician acceptance should begin. He suggested that medical schools immediately start providing assistance by: (1) teaching the definitions, accomplishment, and limitations of this complementary approach to preventive medicine; (2) orienting medical students to the concept of "a lifetime health maintenance program;" and (3) expanding research in preventive medicine. This research should include clinical investigation of screening tests and procedures, developing new tests, developing tests and procedures most suitable for examining specialized population groups and determining more efficient patterns for combining screening test with physician examinations. Yet according to Garfield [1972:2], medical schools still place major emphasis on teaching traditional methods of diagnosing and treating illness. Little, if any, effort is made to acquaint the medical student with AMHT.



Garfield [1972:3] says that these traditional methods, "are wasteful of medical manpower and facilities when employed to search for possible illness in healthy people. With the flood of well and asymptomatic sick that the practicing physician is now seeing, medical schools must begin to teach new methods to prevent overloading and a waste of precious physician time." Schwartz [1970:1264] has also suggested that the most productive way to minimize physician resistance is to indoctrinate him to the concept of AMHT while still in medical school.

The importance of the role of medical schools in gaining physician acceptance has also been noted by writers in other countries. After evaluating the low physician acceptance in Australia, Turner [1971:76-79] offered the following hypothesis: "The physician by virtue of his medical school training and his general orientation, is not trained to deal with the non-patient as represented by the asymptomatic screenee, nor is he given the scientific or psychological tools to accept the opinion of a machine over his own." Therefore, he suggests that the key to gaining full physician acceptance lies in the medical school environment, for it is the medical school environment which molds the physician's perception of the application of modern technology to medical practice.

#### B. DEVELOPING AN INDOCTRINATION AND CONTINUING EDUCATION PROGRAM FOR PRACTICING PHYSICIANS

Medical schools can influence the physicians of tomorrow, but the physician that is practicing now must also be reached if the concept of AMHT is to reach full acceptance in the





forseeable future. Supporters of testing programs must communicate with the physicians that are in practice today. Communications allow transmission of information so that cooperative action can occur and serve as a tool to motivate, to mold attitudes, and to allay false beliefs.<sup>2</sup>

Once channels of communications have been set up, an indoctrination and education program should be established. It is through a well developed education program that physician behavior can be modified and acceptance of AMHT can be improved. Examples of facilities discovering that a program of communications and information can improve physician acceptance are the New York Telephone Company's testing program and the computer laboratory at the University of Leeds, England. Scott and Frederick [1972:460] indicate that when the AMHT program was implemented in the New York Telephone Company, as unanticipated lack of cooperation by personal physicians was noted. This lack of cooperation was attributed to misconceptions about the program, the minimization of the seriousness of certain tests and a general lack of knowledge of the concept. When a letter to the doctor and a descriptive pamphlet, "check in for a check-up," was forwarded with the report, private physician understanding and cooperation improved.

Similar results were noted during a study of 2,034 cases processed by an English KDF9 computer in the electronic

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<sup>2</sup>See Dale S. Beach, Personnel: The Management of People at Work (1970) 2nd ed., p. 581-599 for definition, fundamentals and networks of communications.





computing laboratory at University of Leeds. The researchers had noted that in previous studies clinicians were relatively reluctant and ineffectual users of any computer system. They found, however, that where the physician received a good indoctrination to the use and techniques of the system, physicians noted that instead of their role being undermined, it was enhanced. [Horrocks, *et. al.*, 1972:8-9.]

These two studies indicate that there is a need for a program which educates the practicing physician in the concepts, benefits, and limitations of AMHT. This position is further supported by Williamson, *et. al.*, [1967:941] who point out that the failure of physicians to respond to abnormalities noted during AMHT procedures is a major argument against its widespread use. They suggest that one way to overcome this resistance is to educate the physician to be more responsive to the testing report. This education should include: (1) concepts of the program, (2) theories, techniques and equipment used, (3) costing and other economic data, (4) limitations of a testing program, (5) format of the printed report, and (6) how to evaluate the findings.

Education is not a one shot process, it is continuous in nature. Therefore, a physician education program should be a continuing one if it is to keep the physician updated on new developments in the state-of-the-art and inform him of the results of recent evaluative studies. Since physician organizations currently have periodicals and other means whereby they communicate with their members, they can play an important role in the education program. Furthermore, they state that



one of their goals is to keep their members informed of new developments in the practice of medicine. McWhorter [1968: 199] has stated that not only should the National Associations (such as the AMA) get involved in AMHT education, but that state and local medical societies should also develop programs. If testing supporters can convince local physicians' organizations that AMHT will benefit physicians; these local organizations can do more than provide information to their members. They can promote the testing facilities.

### C. A ROLE FOR MANAGERS OF TESTING FACILITIES

If AMHT is to be an integral part of medical care, all the responsibility for gaining physician acceptance cannot be placed on physicians and their organizations. The managers of AMHT facilities must also take an active role. The literature suggest that many have not done this in the past. In previous sections of this paper, programs that had low physician acceptance had not sought physician participation. However, those that were described as having a high level of physician acceptance (e.g., the Kaiser program and the California Cannery workers program) had communicated with, and had actively encouraged physician involvement. The Kaiser program continually tries to improve acceptance by: (1) periodically seeking physician evaluation of the test used, (2) seeking recommendations for revising the medical history questions to better reflect the patients' needs and (3) trying to eliminate the complaint of "too many things wrong" by developing a computerized advice rule that directs technicians to repeat test when



results are outside normal ranges. [Medical World News, October, 1972:54.]

Perhaps it would be beneficial if the managers of facilities which have experienced low physician acceptance (as well as managers of future facilities) re-evaluated the basic functions of management.<sup>3</sup> Five of these basic functions, presented in terms of improving physician acceptance are:

(1) Representation: In performing this function, the management should present a favorable impression to outside groups with which it comes in contact. Special effort should be taken to inform physicians that their participation is desired, but that the testing facility is not being forced upon their practice.

(2) Innovation: When performing this function, testing facility managers must prepare local physicians for innovative changes before they occur. This entails creating and maintaining an environment in which desired changes can take place; an environment which encourages physicians to welcome and accept change.

(3) Planning: This involves setting objectives for the testing facility and determining what effort will be required to meet these objectives. When doing this, managers should recognize that there is possible physician resistance and develop programs to overcome the resistance.

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<sup>3</sup>See Ernest Dale, Management Theory and Practice, 2nd ed., (1969), especially pp. 5-13, for the functions of management.





(4) Controlling: This will entail the setting of standards of performance that physicians will accept (relative test, acceptable false positive and false negative results, etc.), and constantly measuring the output of the program to see that it conforms to these standards. If any deviation is noted, corrective action should be taken.

(5) Organizing: This function will involve setting up a management structure that will provide for physician input into the program, and physician authority over matters that involve decisions that affect patient care. In this approach, known as participative management, the physician is allowed to participate in the management of the facility. This not only motivates him to accept the concept of AMHT, but provide for professional input that can assist in developing a more effective testing program. Schwartz [1970:1269] supports this position by recommending that the practicing physician be given the opportunity to get involved, and assist in the planning and implementation of AMHT systems that will serve the interest of both the public and the medical community.

Perhaps the most important management functions, in terms of insuring physician acceptance, is planning. Planning has been described as the basic ingredient of any successful venture. Proper planning will take into consideration resistance to change and will cause a search for the course of action that will overcome the resistance. As a part of the initial planning, Startzman and Robinson [1972:226] recommend that a survey of physician opinions be taken prior to the initiation of an AMHT facility. Not only would this allow the planner





insight into the areas of acceptance and rejection, but if discretely presented, could arouse interest in the testing program.

#### D. SUMMARY OF SUGGESTED IMPROVEMENT TECHNIQUES

Several methods of improving physician acceptance of AMHT have been discussed. Evidence was presented which suggests that medical schools and physician organizations must become involved if total physician acceptance is to be realized. Whether they accept the concept as a means of improving diagnosis or merely as a procedure which does the things that a physician should not be doing anyway, their support is necessary. Furthermore, this writer recommends that managers of testing facilities apply sound management practices, using what the behavioral scientists have shown as practical methods to overcome resistance to change. Additionally, managers should continue to evaluate how individual physicians learn to accept new information and innovative changes. A comparative approach in developing this evaluative program would be to consider that the literature, which discusses how physicians learn about new drugs, suggests that they have great reliance on their social network and information providers such as drug company detailmen. Finally, an effort should be made to standardize the format of testing reports and to develop a standard terminology for all testing programs.

These methods (or equally effective ones) of improving physician acceptance must be considered by all persons who will be involved in developing or managing an AMHT program, if greater physician acceptance is to become a reality. They must



remember that physician acceptance is essential, as it is the physician who will determine the ultimate success or failure of AMHT.



## VI. NAVY PHYSICIAN OPINION SURVEY

### A. ASSUMPTIONS AND HYPOTHESES

Prior to mailing an opinion survey questionnaire to a randomly selected Navy Physician population sample, some assumptions which might be derived from the returned data were formulated. In addition, some hypotheses were developed, based on the findings during this writers literature research. These hypotheses were: (1) a large number of Navy Physicians are unfamiliar with the concept of Automated Multiphasic Health Testing, (2) the majority of Navy Physicians have never referred a patient to an AMHT facility, (3) there is a wide range of opinions as to the significance of AMHT and as to what the regimen of test procedures should be, (4) there are several major factors which influence a physician's acceptance or rejection of AMHT, and (5) younger physicians, less than 38 years of age, will accept AMHT more readily than older physicians. The questionnaire was structured to test these hypotheses, as well as to see if rank and medical specialty are influential factors.

It was hoped that the conclusions drawn from the survey results would allow some insight into how well the Navy Physician will accept AMHT; some insight into what influences Navy Physician acceptance, and would be helpful in predicting what must be done if the concept is to be accepted by the majority of Navy Physicians.





## B. THE SURVEY

The Navy Physician opinion survey was conducted between November 15 and December 28, 1974, and can best be described by breaking it down into three divisions: (1) the questionnaire, (2) the population sample, and (3) an analysis of the response data.

The instrument for data collection was a questionnaire prepared by the author (see Appendix B, page 95). The questionnaire was intended to elicit Navy Physician opinions towards AMHT and was designed so that a reasonable knowledge of the concept was required to fully understand all the questions. Because the questionnaire was to be mailed and no follow-up contact with the respondents or non-respondents planned, a limited number of questions were asked. Physicians were to indicate their response by checking yes or no. In addition, a limited amount of personal data was requested and a space was provided for comments.

The questionnaire was mailed to 300 Navy Physicians on active duty. This is approximately 8.3% of the Navy Physician population. Eleven questionnaires were returned as undeliverable, reducing the sample size to 289 or approximately 8% of the population. One hundred seventy eight (178) questionnaires were completed and returned -- a 61.5% response rate. The names and addresses of the physicians surveyed were selected at random by a third party from the alphabetical listing maintained by the Chief, Bureau of Medicine and Surgery, Washington, D. C. The only specification made in the request for the mailing list was that the physicians selected be on active duty.



The medical specialty and rank structure of the respondents were as follows:

<u>Medical Specialty</u>	<u>Number</u>	<u>Percent of Total</u>
Orthopedics	8	4.6
OB-GYN	12	6.9
Internal Medicine	42	24.3
Pediatrics	11	6.4
Psychiatry	9	5.2
Surgery	17	9.8
Radiology	7	4.0
General Practice	16	9.2
Family Practice	15	8.7
Anesthesiology	13	7.5
Other	25	13.4
	<u>175</u>	<u>100.0</u>

(Note: 3 respondents did not indicate any specialty)

<u>Rank</u>	<u>Number</u>	<u>Percent of Total</u>
LT	55	30.9
LCDR	83	46.5
CDR	22	12.4
CAPT	17	9.5
REAR ADMIRAL	1	.6
	<u>178</u>	<u>100.0</u>

The 61.5% response rate was accepted without question. No attempt was made to contact non-respondents or respondents who left some items blank. Each physician was provided a pre-addressed return envelope with a stated deadline of 15 December 1974 for return. Upon receiving the questionnaires, the responses were coded on punched cards and processed by an IBM-360 computer, utilizing the Statistical Package for The Social Sciences (SPSS) program. Tabulation of responses were made by medical specialty, rank, sex, age, current status (Intern, Resident, Board Certified or Qualified), familiarity with AMHT, and by whether or not the physician had previously referred a patient to a testing facility. [Comments received are listed in Appendix C.]



### C. RESULTS OF SURVEY

In general, the survey showed that there is a moderate level of acceptance for AMHT among Navy Physicians. Eighty-six (86.4) percent of the physicians said they would use AMHT if it were available, but only sixty-five (65.4) percent recommended installation of AMHT units at all Naval Hospitals. Table III shows the total number of responses, by question. Table IV shows the responses converted to percentages. (Note: After using the term "multiphasic screening" on the questionnaire, it was noted that the term most often used in the current literature is Automated Multiphasic Health Testing. Thus, AMHT is used in the presentation of the survey.)

Physicians apparently feel that AMHT is more suited to physical examinations than for general hospital use. This is supported by Table V (by rank), Table VI (by medical specialty), and Table VII (by age group). These tables show that there was a higher percentage of yeses for installation at Armed Forces Examination Stations and at other large examination centers than for installation at all Naval Hospitals.

Table VII supports the hypothesis that younger physicians will accept AMHT more readily than older physicians. Table VIII shows that a physician is more likely to accept AMHT as he becomes more knowledgeable about the concept, as indicated by the percentage increase from raw total pressure to familiarity with the concept, to those who have referred patients to a testing facility.



TABLE III

<u>Total Response</u>		NUMBER OF RESPONSES	
<u>Questions:</u>		<u>YES</u>	<u>NO</u>
1.	Are you familiar with multiphasic screening? [Note: Some responders who failed to answer this question, answered later questions as if they had some knowledge of the concept.]	132	46
2.	Have you ever referred a patient to a screening facility?	36	141
3.	Do you think that the concept of automated multiphasic screening, utilized in conjunction with a computer, is a significant innovation in medicine?	136	20
4.	Do you think that a properly designed screening program could be used as an entry mechanism for "primary care"?	142	22
5.	Would you use a screening facility if it were available to you?	140	22
6.	Do you think that multiphasic screening should be used at Armed Forces Examining Centers and at other activities that perform a large number of physical examinations?	143	19
7.	If multiphasic screening was available at Naval Facilities, which of the following do you think should be made a part of the regimen of tests or functions of a screening facility:		
	a. screen all new patients reporting for primary care.	116	46
	b. screen patients reporting for physical exams only.	49	103
	c. take detailed patient histories.	110	48
	d. perform a standard set of lab tests on all patients.	104	58





TABLE III (Continued)

Questions:		<u>YES</u>	<u>NO</u>
e.	perform only the lab test ordered for each individual patient.	68	79
f.	perform the health status of chronically ill patients.	90	68
g.	based upon an internal data bank, provide computer determined probabilities of certain conditions being present (computer assisted diagnosis).	125	34
h.	prescribe a recommended therapeutic regimen for the physicians' review and concurrence.	72	88
8.	Do you think the following factors have a direct influence on a physician's acceptance or rejection of multiphasic screening/testing? Circle the three that you believe to be most influential.		
		NUMBER CIRCLED AS BEING MOST INFLUENTIAL	
a.	exposure to the concept in medical school.	121	16
b.	peer group recommendation.	116	16
c.	being allowed to participate in the planning of a facility.	76	35
d.	personal involvement in the operation of a facility.	107	29
e.	management style of the operators of the screening facility which the physician has contact.	102	16



TABLE III (Continued)

	NUMBER CIRCLED AS BEING MOST INFLUENTIAL	<u>YES</u> <u>NO</u>	
		YES	NO
f. exposure by reading in medical periodicals.	41	92	25
g. standardization of procedures and records.	76	120	15
9. Would you recommend installation of multiphasic screening facilities at all Naval Hospitals?		100	53

PERSONAL DATA:

Age: Range 25 to 58  
Sex: 177 males, 1 female

CURRENT STATUS:

Interns 6, Residents 37  
General Medical Officer 25  
Board Eligible/Certified 103



TABLE IV. Total Response, In Percentages.

<u>Questions (abbreviated):</u>	<u>YES</u>	<u>NO</u>
Familiar with multiphasic screening.	74.4	25.6
Had referred a patient to a screening facility.	20.3	79.7
Thinks M/S is a significant innovation in medicine.	87.2	12.8
Multiphasic could be used as entry for primary care.	86.6	13.4
Would use multiphasic if it were available.	84.4	15.6
Should be used at AFES and large exam centers.	85.2	14.8
Use to screen all new patients.	71.6	28.4
Use to screen for physical exams only.	32.2	67.8
Take detailed patient histories.	69.6	30.4
Perform a standard set of lab tests.	64.2	35.8
Perform lab tests ordered on an individual basis.	46.3	53.7
Monitor health status of chronically ill.	57.0	43.0
Use for computer assisted diagnosis.	78.6	21.4
Prescribe a recommended therapeutic regimen.	46.5	53.5
Following factors have a direct influence on a physicians acceptance or rejection of multiphasic.		
a. exposure in medical school.	88.3	11.7
b. peer group recommendation.	87.9	12.1
c. being allowed to participate in planning.	68.5	31.5
d. personal involvement in the operation of M/S.	78.7	21.3
e. management style of facility operators.	86.4	13.6
f. exposure by reading in medical periodicals.	78.3	21.7
g. standardization of procedures and records.	88.9	11.1
Recommend installation of M/S at all Naval Hospitals.	65.4	34.6





TABLE V. Yes Responses by Rank, In Percentages.

	LT	LCDR	CDR	CAPT	RADM
Would you use multiphasic if available.	93.6	81.8	90.0	88.2	0.0
Recommend installation at AFES and other large exam centers.	84.0	89.5	94.7	87.5	100
Recommended installation at all Naval Hospitals.	58.3	67.1	68.4	73.3	100

TABLE VI. Yes Responses by Medical Specialty, In Percentages.

	ORTHO	OB-GYN	INTERNAL MEDICINE	PEDS	PSYCH	SURGERY	RADIOLOGY	GENERAL PRACTICE	FAMILY PRACTICE	ANESTH	OTHER
Would use multiphasic if available.	71.4	91.7	90.2	80.0	71.4	94.1	71.4	92.3	92.9	75.0	88.2
Recommend installation at AFES and other large exam centers.	100	81.8	87.8	100	100	81.3	85.7	80.0	86.7	100	82.4
Recommended installation at all Naval Hospitals.	33.3	70.0	73.7	54.5	80.0	68.8	42.9	60.0	73.3	54.5	66.7



TABLE VII. Yes Responses by Age Group, In Percentages.

	Physicians less than 38 years of age	Physicians 38 years of age and older
Would use multiphasic if available.	89.4	80.0
Recommended installation at AFES and other large exam centers.	93.9	80.5
Recommended installation at all Naval Hospitals.	70.2	55.8

TABLE VIII. Selected Yes Responses, In Percentages.

	Raw Total	Those Familiar with Multiphasic	Those Who Had Referred a Patient to Testing Facility.
Would use multiphasic if available.	84.4	86.7	91.7
Recommended installation at AFES and other large exam centers.	85.2	86.8	88.9
Recommended installation at all Naval Hospitals.	65.4	69.7	80.0



#### D. CONCLUSION BASED ON SURVEY

The questionnaire was designed to test the assumptions and hypotheses presented. The returned survey data indicates that: (1) 25.6% of Navy Physicians are unfamiliar with the concept of AMHT, (2) 79.7% have never referred a patient to a testing facility, (3) there is considerable disagreement as to the scope of AMHT, i.e., should there be a standard set of lab test, should all patients receive testing or only those reporting for physical exams and whether or not AMHT should take on the role of computer assisted diagnosis, (4) there are in fact several factors which influence a physician's acceptance or rejection of the concept and (5) younger physicians are more likely to accept AMHT than older physicians. These findings are in direct support of the hypotheses developed prior to the survey. However, no attempt was made to determine the effect of medical specialty on acceptance of AMHT. This was due to the fact that although there was a noted variance in the responses by medical specialty, no apparent pattern was identified.

The factors circled as being the most influential in a physician's acceptance or rejection of AMHT are listed in order of the number of responses received. (Note: Respondents were to circle the three (3) they believed to be most influential):

	<u>Number of Responses</u>
Peer group recommendation	90
Exposure to the concept in medical school	84
Management style of facility operators	83
Personal involvement in operation of AMHT	76
Standardization of procedures and records	76
Exposure by reading in medical periodicals	41
Being allowed to participate in the planning of a facility	37



These responses support the recommendations made in Section VII.

The physician reaction to the questionnaire indicates that there is a moderate level of Navy Physicians acceptance of AMHT at this time. It is believed that this level could be raised with proper educational programs and other management effort. Since the Navy is currently planning for installation of AMHT systems (see Section VII), this effort should be taken now -- before the installations are accomplished. It must be remembered that it is the physician and his acceptance of AMHT that will decide its fate in the Navy Health Care Delivery System.





## VII. THE ROLE OF AMHT IN THE NAVY'S HEALTH CARE DELIVERY SYSTEM

### A. BACKGROUND

The idea that the physician should work at his highest level of skill and do only those things which a physician can do best is central to the AMHT concept. In short, the physician should practice intensive medicine; all other duties and tasks of a routine nature should be left within the physician's sphere of responsibility and supervision, but attended to by his assistants. [Flynn, 1969:234.]

Unfortunately, this is not the case in the Navy's system of health care delivery. Each day, patients find it more difficult to see a physician for general health care. They encounter barriers and problems in making even routine appointments because the reduced number of physicians are too busy practicing crisis medicine to be overly concerned with or to be able to spend much time with routine and minor problems.

Under these conditions it is necessary to seek solutions to problems which are almost as difficult to identify as they are to solve. Simply obtaining more physicians and training more allied and paramedical personnel, or building newer and larger facilities on a wholesale basis in an attempt to close the gap is probably an inadequate and short-sighted solution. Such brute force approaches will merely perpetuate the existing military medical complex and its problems on a grander scale. Time, the external political environment, and economics seem to prohibit such frantic efforts, which are seen as providing only a partial solution.



One important and immediate alternative is the development of a health care system which promotes greater efficiency of available resources and talent, through such innovations as computers and automated multiphasic testing techniques. Testing or screening techniques are already the basis of a large part of the military system of triage and health care delivery. Most treatment starts with a brief screening examination by a nurse or corpsman prior to active involvement by the physician. In many cases preliminary laboratory tests are performed. In some of the newly established acute care clinics, many patients are treated by paramedical personnel and do not even see a physician.

AMHT techniques could utilize automation and computers to increase the efficiency of the triage or screening concept. Thus, increasing the efficient utilization of physician time. AMHT, then, could have immediate input and lasting effect in the solution of the current military health care crisis.

Unfortunately the major impact of computer technology on Naval hospitals and health care to date has been in the area of hospital supportative services -- those matters indirectly related to direct patient care. Yet, modern technology also offers interesting and innovative alternatives to the present method of direct patient care; alternatives which can provide significant benefits in the military hospital setting, and in the larger military health care delivery system.

Many civilian health care communities have marshalled the resources and the courage to move systematically into the new era of automated health care with a high degree of success.



[Wright, 1972:72.] The military system of health care delivery has not done as well. Now with monetary and staffing restraints, coupled with fewer physicians in an all volunteer force, military medicine is on the brink of crisis. 'Many existing treatment facilities are largely outmoded and unsuitable to modern medical technology. Yet, only recently has the military moved toward automation of its health care delivery system.

In recognition of the above conditions in both the military and some civilian health care communities, the Advanced Research Projects Agency of the Department of Defense contracted with Arthur D. Little, Inc., a consulting group, "...to apply the techniques of systems analysis to the problem of designing the health care systems for (future) domestic military bases." Just what value and impact this study, entitled System Analysis for a "New Generation" of Military Hospitals, Final Report [DoD, 1971:Vols. 1-8] will have on the delivery of health care in the military services remains to be seen. The interest in the study, as far as this thesis is concerned, is the comments and recommendations concerning AMHT. The Final Report will be referred to as "The Report."

#### B. THE ARTHUR D. LITTLE POSITION

The Arthur D. Little position on AMHT is best illustrated by providing the reader with direct quotes from The Report, such as the following:<sup>4</sup>

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<sup>4</sup>References to The Report are noted by inclusion of volume, section, and page numbers in parenthesis at the end of each quote.





- (1) Computer Applications in (military) hospitals for purposes other than accounting present something of a dilemma (*sic*). In general they have fallen short of their promise... Many applications must be considered novel or merely experimental, and their benefits difficult to predict. (2.5.1).
- (2) ...there are enough problems with such systems (AMHT) so that it is hard to foresee (*sic*) widespread use of full-scale computerized systems for a decade or more. (1.4.9).

The above quotes illustrate the Arthur D. Little group's position and suggests that AMHT type operations will not be feasible for at least ten years. This is in opposition with findings presented in previous sections of this thesis.

- (3) ...because the costs are so disparate (between AMHT systems and traditional methods)...we do not believe that computer-based multiphasic testing (AMHT) has a role in base-level military hospitals. (2.5.15).
- (4) Our analysis has led us to discard certain innovative concepts which originally appeared attractive but ultimately proved undesirable. ...we recommend that long-term (say, 5 years) reconsideration to our conclusions be given. The concepts which deserve this reconsideration are: (1) multiphasic testing, (2) disposable linens, (3) automated materials handling, and (4) automated patient monitoring,... (4.4.7).

Item (3) sets the tone for the entire argument put forth in The Report against AMHT -- that argument centers on the cost of AMHT operations at the Kaiser Facility, Oakland, California contrasted with the Physical Examination Section (PES) at Fort Dix, N. J. which is not automated and utilized the usual (traditional) screening technique of physical examination. The following table is reproduced from The Report:



TABLE I.

<u>Item</u>	<u>Kaiser</u>	<u>PES</u>
Personnel	\$148,000	\$136,000
Supplies	62,000	30,000
Services	47,000	36,000
Equipment Amortization	27,000	6,300
Computer <sup>5</sup>	108,000	
Total Costs	\$392,000	\$208,300
Cost Per Exam	\$ 16.30	\$ 8.69

Other tables in The Report (notably, 5.4.1, 5.4.2, 5.4.3, and 5.4.4) attempt to present a staffing and utilization comparison of the Kaiser AMHT system and the military PES method. Again, the main thrust of their analysis and argument is purely fiscal, and begins by assuming that AMHT is too new to evaluate conclusively or, to be justified unless AMHT is either better, or cheaper, or both.

Much of the criticism accompanying the above quotes focused on the absence of long-term proof that early detection of illness can materially influence the natural course of disease, and challenged the benefit of low yields and high cost per detected illness. This accentuation of the negative aspects of evaluating AMHT on its yield of sickness rather than its yield of health is a by-product of the preoccupation with sickness that has historically prevailed throughout medicine. "It is this misplaced emphasis that produces reports that read,

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<sup>5</sup>Note that computer costs were not included in the PES costs even though some computer capabilities were available at the Fort Dix Facility. Furthermore, military salaries have increased drastically since this data was collected [the 1968-1969 time frame]. At the lower pay grades, the increase has been more than 300%.



'It costs \$2,000 to detect one true positive cancer of the breast by mammography in 500 women,' rather than the more logical, 'It costs \$4 each to assure 499 women that there is no evidence of breast cancer and \$4 to detect one cancer that through early surgery may have a better prognosis.'" [Garfield, 1970:1088.] It should be recognized that there is a definite positive value in detection of health. The patient gains security and can plan his life accordingly, and the provider of services can more rationally allocate his scarce resources. It is the lack of consideration of these values that distorts quoted costs per detected illness and renders them relatively meaningless. [Garfield, 1970:1088.]

- (5) On balance, then, we conclude that multiphasic testing is too much more expensive than the present method of giving certification physical examinations to be justified. (5.4.19).
- (6) On the basis of an analysis of the benefits to be derived from AMHT and the costs for providing it, we have concluded that as matters stand now it has no place in the base-level military health care system. One of the important reasons for reaching this conclusion, which is different from that reached by the Kaiser Foundation and the Public Health Service, is that the military population is generally young and healthy...and the additional tests provided by multiphasic testing are not likely to be important to this group. (5.4.19).

Not only is Item (6) open to debate, but more importantly, it seems to assume that dependents and retired personnel are not treated at the base level and that even senior officers and enlisted personnel are young. Also both the above quotes are again a play on the cost-effectiveness analysis between



the Kaiser AMHT system and the Fort Dix manually operated facility. An appropriate analogy might be the comparison of a bicycle with a Bentley.

- (7) We are not aware of any developments which can be expected to make AMHT a great deal different in the next decade from what it is now. (5.4.20).

This statement is counter to the evidence found in the articles listed in the bibliography of this thesis.

- (8) We identify no research and development specifically needed in the field of multiphasic testing except for that associated with development of computer uses. (5.4.20).

- (9) ...military hospitals are sufficiently different from civilian hospitals so that they cannot rely upon civilian developments to solve their problems, and the Department of Defense will have to undertake its own computerized hospital systems. (7.5.2).

These two statements are at odds, one with the other. On the one hand the report suggests that there is no requirement for R&D in the diagnostic area of AMHT, while, on the other hand, it suggests that there are no civilian developments that may be adopted by the military health care system. This is interpreted to mean that DoD must then develop its own systems. The Report, in Section 5 and Section 7, offers a rather detailed discussion of the success of an AMHT system used by the Armed Forces Entrance and Examining Station in Philadelphia, which is adjudged to be successful by The Report. The specific recommendation is made to continue the operation of AMHT at facilities.







There are many other references made to AMHT in The Report, but those quoted are considered sufficient to give the reader a feel for the general attitude towards AMHT by the Arthur D. Little group.

#### C. NAVY ACCEPTANCE OF AMHT

The general acceptability of AMHT as an adjunct in the delivery of health care has been given a certain amount of respectability and a decided boost by the recent chain of "third-party payers" that have approved AMHT for payment under their programs. Kaiser, The Health Insurance Plan of Greater New York, Medicare, Medicaid, Blue Cross, Blue Shield, The U.S. Public Health Service, and the Veterans Administration are but a few.

The acceptance of AMHT by the Navy has not been very rapid. Fortunately, however, the Bureau of Medicine and Surgery has not followed the Arthur D. Little recommendations. A manually operated battery of tests was set up at Naval Air Station, Brunswick, Maine. Additionally, a close resemblance of an AMHT system, known as PROMISE, was developed at the Aerospace Medical Center at Pensacola, Florida around 1971. These two examples appear to be the only effort by the Navy to apply the AMHT concept prior to 1974.

In November 1974, U.S. Navy Medicine [1974:41] reported that a prototype AMHT system is now being developed under the auspices of the Tri-Service Medical Information System (TRIMIS) program. The design specifications for the system were developed by the Naval Medical Data Services Center in Bethesda, and the



Outpatient Service, National Naval Medical Center (NNMC), Bethesda, Md.

The components of the proposed AMHT system will include: (1) medical history, (2) body height, weight, skinfold and temperature, (3) visual acuity and intraocular tension, (4) auditory acuity, (5) blood pressure and pulse, (6) electrocardiogram, (7) selected clinical laboratory determinations, (8) x-ray, (9) spirometry, and (10) determination of specific examinations on the basis of patient age or sex. It is expected that the system can process approximately 80 patients during a 7-hour period.

Procurement of the system is expected to be completed by March 1975, with installation expected in February 1976. If this prototype is successful, plans call for installations at the Naval Regional Medical Centers: San Diego, Oakland, Philadelphia, Portsmouth, Va. and at other medical facilities within the military services.

The major objectives of the Navy's AMHT system are:

- (1) Increase emphasis on preventive medicine.
- (2) Improve capability of handling increasing numbers of patients.
- (3) Utilize physician time more efficiently.
- (4) Expedite referral of patients to specialty clinics.
- (5) Reduce the time required for inpatient workups.
- (6) Increase capability of educating patients and hospital personnel.
- (7) Provide a data base for research.



From the above, it appears that the Naval Medical Department is turning towards innovative thinking and increased use of technology. Perhaps AMHT will play a major role in future Naval Health Care Delivery, in spite of the Arthur D. Little report. However, the results of the Navy Physician Opinion Survey, discussed in Section VI, indicates that action is required to increase Navy Physician knowledge and acceptance if it is to play this role.



## VIII. THE FUTURE OF AMHT

Automated Multiphasic Health Testing facilities, despite the disagreement in their contributions and the polar views of the present level of physician acceptance, are continuing to grow in numbers. The future growth and expansion of the concept will depend on how well the medical community accepts it, and, to a large degree, the amount of support given it by the Federal Government and influential groups in the private sector.

### A. GOVERNMENTAL INTEREST AND SUPPORT

Much of the impetus for developing AMHT has already come from governmental interest and support. In 1968, a Senate Committee on finance requested the Secretary of H.E.W. to conduct a study of the possible coverage (under Medicare) of the cost of AMHT and other preventive services designed to detect and prevent disease in old age. As a result, an advisory committee was set up to study the subject. The committee concluded that comprehensive health testing should not be covered by Medicare at that time. However, the committee recommended:

that a series of well evaluated, population based studies be performed to determine the feasibility of including comprehensive health screening and other preventive health services. Specific studies should focus on questions related to validity, reliability, acceptability to patients and physicians, and feasibility in relations to the cost of screening and follow-up. [H.E.W. Provisional Guidelines, Vol. 2, 1970:ix.]





Pursuant to this recommendation, the National Center for Health Services Research and Development began a research and development program in AMHT. As mentioned earlier, five centers were set up throughout the U.S. Additionally, grants were made for studies at various private facilities. At the same time, technical and clinical experts within the public health services began to take a concentrated look at AMHT. Results of these studies are periodically published at government expense. An Automated Multiphasic Health Testing System Advisory Committee was appointed and this committee is required to make periodic progress reports to the National Center for Health Services and Research Development [H.E.W. Provisional Guidelines, Vol. 2, 1970:x.]

The military services have also shown an interest in multiphasic testing as noted in Section VII which discusses the Arthur D. Little Company study on "The New Generation of Military Hospitals," and the AMHT centers planned for Naval facilities. Thus, it can be assumed that there is and will continue to be a great deal of interest in AMHT within the Federal Government.

#### B. IMPACT OF A NATIONAL HEALTH INSURANCE PROGRAM

The likely advent of some form of government-controlled national health insurance program which covers all segments of the population (especially since the new Chairman of the House Ways and Means Committee, Congressman Ullman, says that such a program is his number 2 priority) could completely overwhelm medical care sources as they are presently constructed.



Medical practice, therefore, must be prepared not only to treat those persons currently receiving inadequate medical care, but also to deal with the onslaught of the "worried well." This increased demand for services, no longer as controlled by out-of-pocket cost, could overload the entire medical care delivery system. The use of a National AMHT System to channel this increased demand would provide the following advantages: (1) efficiency of service through close integration of test procedures; (2) improved efficiency of physicians by providing a large amount of information about their patients; (3) quality control through automated equipment; (4) more test at less cost and at a greater speed; (5) earlier detection of a wider range and a greater number of unsuspected diseases; and (6) computer data processing capabilities that would permit epidemiologic research not possible heretofore. [Collen, 1966:145.]

#### C. ISSUES YET TO BE RESOLVED

Before AMHT can provide the above advantages, however, there are several issues that must be resolved. Some of these, according to Holland [1971:88-89] are:

(1) A substantial segment of the medical community opposes multiphasic testing because they state that it does not discover enough disease to justify its engrossment upon the already limited medical resources of the country.

(2) Highly sophisticated automated multiphasic health testing is confused with the present highly inefficient system of periodic health examinations or "yearly checkups" used widely by internist and general practitioners.



(3) A hit-and-miss system of follow-up in many instances results from giving the patient the primary responsibility of examination and final evaluation.

(4) Considerable controversy exist as to whether early detection and treatment of asymptomatic disease results in decreased morbidity and mortality in comparison to adequate treatment of symptomatic disease.

(5) Automated multiphasic health testing has often been stereotyped as mass screening of asymptomatic individuals. The use for periodic thorough re-evaluation of the chronically ill patient, for rapid initial evaluation of the ambulatory hospitalized patient, for thorough evaluation of the symptomatic patient, and for provision of a good data base for entry into a comprehensive health care system has been overlooked.

(6) Most published reports of multiphasic testing have given the results in terms of percentage of abnormalities for each test or a list of diagnosis resulting from often limited follow-up. More meaningful evaluation of testing abnormalities requires a comprehensive false positive results.

Another issue which must be evaluated is represented by the following statement: "A common misconception, shared by many developers and designers of screening systems, is that a medical diagnosis represents hard cold facts rather than a physicians objective and subjective judgement." [Smith, 1961: 88.] Smith states that, "available evidences suggests that obtaining a medical history and recording physical symptoms is a complex judgemental process rather than a simple tabulation





of discrete information items." Furthermore, he contends that inspection of hospital records shows that when different physicians have occasion to see a patient independently, they sometimes tend to produce a dissimilar medical history. Thus, the determination of what represents factual raw data for diagnosis is a question that must be answered. "This fundamental consideration must be recognized, and system designers must somehow transfer physician knowledge and experience to a computer memory storage." [Smith, 1961:88.] AMHT system designers must also establish which parts of a diagnostic procedure are most suited for the computer and which parts must be left to the physician. Once established, the designer must get physicians to accept the divisions.

#### D. OBSERVATIONS AND PREDICTIONS

The crucial variable in resolving these issues is, again, the physician. It has been shown that physician acceptance can be correlated with the amount of their exposure to the subject; the more experience and information a physician has, the more likely he is to accept the testing concept. A considerable amount of effort is likely to be made in the future to gain physician acceptance. This effort is expected to be supported by medical schools; by medical societies, and organizations through their periodicals and professional meetings; by government; by other groups (e.g., labor unions), by community leaders; and by individual physicians themselves.

Westwood [1973:32-38], stating that there is a significant trend of more physician acceptance of AMHT, offers the following predictions:





(1) Multiphasic health screening will be rapidly made a part of private health care for most citizens.

(2) It will not be confined to the healthy population alone, it will be used whenever a patient's total health needs to be reviewed.

(3) It will be employed by clinics, hospitals, public health departments, industry, insurance companies and private physicians.

(4) The next generation of physicians will accept it as the desired method of meeting their needs for rapid processing of medical data. [Westwood, 1973:38.]

McWhorter [1968:199] says that AMHT will become an integral part of the practice of medicine whether physicians like it or not. He contends that if physicians do not take the lead in promoting its growth, other groups will. Speaking as a physician he says:

If we in medicine do not take the leadership in developing these programs and guiding their direction, their scope, and content, this will be done by one of the various other agencies or organizations which have expressed a keen interest in this type of medical practice.

All too often in the past we (physicians) have stood on the sideline and have been accused, although in many instances falsely, of being against things which were good. Nevertheless, we have found many programs activated or enacted by law which were objectionable to us and not in the best interest of the medical care of patients. Hopefully, in this instance we will not take a position of complete opposition, but will assume the leadership that is necessary to direct this program in its proper development and through proper channels so that it will be one which is of value to the patient and to the physician. [McWhorter, 1968:200.]



The author agrees with the predictions that AMHT will become an integral part of the practice of medicine, but, with and only with -- an increase in physician acceptance. Without complete acceptance of the concept, a physician will not support nor utilize a testing facility. However, if managers of AMHT facilities, medical schools, and physician organizations follow the guidelines suggested in Section V of this thesis there will be adequate acceptance. Once non-physician supporters, physicians, and system designers adopt common objectives for AMHT, its only limitations will be those of a technological nature.

New developments will take place in the testing instrumentation, recording devices, and computer technology. There will be higher levels of automation. Within the next ten or fifteen years, we should see the application of such concepts as thermography, ultrasonic, optical scanning and pattern recognition devices, and electromagnetic flow measuring instruments. With today's space age technology, the limitations of AMHT are bound only by the human mind.



## IX. CONCLUSION

This thesis has suggested that there are powerful, governmental, professional, social, political, and economic pressures to develop a system which will provide low cost health check-ups for all of America's people. Supporters of AMHT contend that it is such a system. These supporters have generated a wave of interest in the concept which has resulted in a rapid increase in the number of testing facilities in the past few years. It has been predicted that this rate of growth will increase in the future, reaching 1,800 facilities by 1980.

The majority of the articles evaluated in the preparation of this thesis were in direct support of AMHT as a concept or tended to support a specific project or program. This is not to suggest that there is not organized resistance to AMHT, or that critical articles do not exist; they do. The critical articles however, tended to dwell on the idiosyncrasies of a particular system, program, or application. Additionally, some were critical of the expenses involved, but most of the critical articles found some benefit in AMHT. Therefore, the author concludes that the majority of the idiosyncrasies and shortcomings of the AMHT concept are essentially of a minor nature, which can presumably be remedied as a system is developed to serve the particular needs of the physicians, technicians, and institutions which undertake the introduction of AMHT.





Long-term controlled studies on the effects of periodic health examinations on morbidity and mortality are still incomplete. However, a multitude of public and private agencies have come to the conclusion that AMHT is economical, saves physician and patient time, provides better quality tests, reduces average inpatient stays, is highly acceptable to patients, promotes better utilization of paramedical personnel, and is an effective and efficient method of detecting disease. [Janner, 1971:1281.]

Present facilities have demonstrated that AMHT can rapidly process a large number of diagnostic tests. When interfaced with a computer, it can be a medical information system which simplifies the workload of the physician, as well as his administrative support staff. Available evidence further suggests that AMHT offers the capability to improve diagnosis now, and in the future to assist in providing a more accurate prognosis. For example, in conditions such as myocardial infarctions, the patient's prognosis depends not on the presence or absence of such complicating factors as shock, congestive heart failure, or arrhythmias. A computer could be programmed to search for data indicating the presence or absence of such factors, analyze this data, and provide an impartial prognosis to the physician within a few nanoseconds. [Glessner, *et. al.*, 1972:180-189.]

An attempt has been made to show that the future of AMHT is not bound by technological limitations, but that its growth is dependent on government support, influential private group support and -- most importantly -- physician acceptance. There



is strong evidence that physician acceptance is determined by several identifiable factors, e.g., (1) his knowledge of the benefits and limitations of a testing program, (2) his experience with a testing program, and (3) the method used by the management of testing facilities to solicit his involvement in the program. Although a large number of physicians appear to accept the concept of AMHT; there is considerable conflicting findings in the literature. Thus, a definite assessment of the present level of physician acceptance cannot be made. However, the author contends that there is a group of physicians at each end of the accept/reject continuum, with the majority falling somewhere in between. This position is supported by the literature and by the wide range of comments received from the Navy Physician Opinion Survey (see Appendix C). Since previous studies suggest that a high level of acceptance can be obtained if medical organizations, medical schools, and managers of testing facilities exert sufficient effort; a higher level of physician acceptance of AMHT is attainable.

With the ending of the doctor draft and the noted decline in the number of Navy physicians, AMHT may well be one approach which will allow better utilization of physician time. AMHT could also assist the reduced number of physicians in improving diagnostic determination and increasing the quality of patient care. Therefore, the Navy Medical Department should continue to stay abreast of the latest developments in the state-of-the-art in AMHT.



The procurement of the prototype system for the National Naval Medical Center, Bethesda, Md. and the planned installations at other Naval Regional Medical Centers appears to be a giant step forward. However, the results of the Navy Physician Opinion Survey indicates to this writer that the Navy should institute a physician education program covering AMHT. Especially, since 25.8% of the survey respondents indicated that they were not familiar with the concept.



## APPENDIX A: THE AMA'S POSITION ON AMHT

The following quotes were selected from the AMA's official Statement on Multiphasic Testing, AMA, 1972:p.1-12.

### I. GENERAL:

In assessing the need for and quality of medical services, the benefits and limitations of all available patient management techniques should be considered. Techniques employed as well as the alternative methods used should be considered for purposes of the evaluation. In assessing the potential role of MHT (Multiphasic Health Testing) in health care, the same assessment techniques should be applicable.

Where MHT programs are properly integrated into the health care system, the following benefits may be found: (1) improved quality of medical records; (2) more efficient use of the physician's time by maximizing the use of allied health personnel and technical aids; (3) earlier detection of a wider range and a greater number of asymptomatic diseases in apparently healthy people; (4) improved opportunity for preventive care through accumulation of baseline health data; (5) possible reduction in overall health costs due to early detection of disease and decrease in hospitalization; (6) improved health education when combined with patient counseling, and (7) creation of a valuable medical data base.

If automation justified by volume is added to MHT, other possible benefits may include: (1) opportunity for improved quality control with automated equipment; (2) improved efficiency by providing a larger number of tests with accurate results at greater speed and less cost; (3) services to a greater number of patients; (4) availability of consistent data for peer review; and (5) improved opportunity for studying the etiology of disease and other facets of diagnosis and therapy through computer processing, storage, and computational methods.

Multiphasic health testing offers the potential of increased physician productivity by decreasing





the time spent in routine procedures. If properly utilized, it can provide large amounts of medical history and factual observations in a shorter period of time and with a potential cost savings to the patient. Multiphasic health testing can serve as one of the entry points into the health care system. It should not be viewed as replacing or interfering with the patient-physician relationship, but rather it can be used to enhance this relationship through the acquisition and interpretation of a broad base of health information on the individual patient.

To be most effective, MHT should represent a choice of the individual physician who wishes to use it as a supporting diagnostic method for his patients. The patient's physician may then receive the test results and evaluate and interpret them in the context of the overall management of his patients. In this framework MHT programs can be utilized to provide health services to larger segments of the population while maintaining quality and continuity of care.

Physicians have participated in many of the research and demonstration MHT programs and in the development of operational programs both publicly and privately financed. As the number of multiphasic health testing programs grows, physicians can expect to become increasingly involved either directly or indirectly in their planning, development, and operation. The opportunity to exercise medical leadership in this area must be maintained in an effort to develop health care systems that will meet the needs of the community.

## II. GUIDELINES FOR PLANNERS AND OPERATORS:

1. Multiphasic health testing is a method of acquiring, storing, collating, and reproducing medical data on individual patients. The testing procedures are considered to be incomplete health services. Provisions must be made for a physician to interpret and evaluate this medical data base as an aid in continuing patient care.

2. The multiphasic testing program should meet applicable licensing requirements and be appropriately evaluated for quality control.

3. Physicians must be involved in the planning and development of testing programs.



4. The operation of all MHT programs must be supervised by qualified physicians at the testing center, particularly in regards to any abnormal findings, and these physicians must see that the patient is instructed to obtain medical advice for significant abnormal findings.
5. The system should be designed to make maximum use of allied health professionals and should utilize technical automated techniques where justified.
6. For professional value and economic feasibility, the program should include tests that are simple, safe, easy to interpret, inexpensive and quick to perform, and that have accurate sensitivity, specificity, high predictive value, and patient acceptance.
7. The testing system should include the following...accuracy of output, saving of time of physician and allied health personnel, adequate utilization, efficient flexibility for customization to physician and patient needs. The program should establish individual ethnic, geographic, and other variations of normal and abnormal patterns.
8. The program should provide for confidentiality of patient data.
9. The testing program should be used where feasible, to meet otherwise unmet community health needs and should be integrated into the continuing health care system.
10. The testing program should be designed to meet various objectives such as diagnostic services, health maintenance and guidance in management of ongoing illness including chronic disease.
11. Evaluation methodology should be built into the program to determine the acceptance and use, yield, false positives and false negatives, as well as the long-term effects of the program on illness and the needs and demand for health services. The program should include a documented accounting system, at least for internal use, and a reasonable cost finding system that would allow for cost analysis and cost summaries.
12. The program should maintain freedom of choice for both the physician and the patient. (AMA,1972: 10-11.)



### III. LEGAL AND ETHICAL CONSIDERATIONS:

#### a. Legal

1. A physician who receives reports from an MHT (multiphasic health testing) organization involving persons who have no prior arrangement with him for their evaluation may choose to accept such persons as his patients and communicate with them and provide such additional services as are necessary and usual in the physician-patient relationship.
2. If the physician elects not to accept the patient, he may return the reports to the MHT organization. If he does so, it is recommended that a covering letter be sent stating that he has not evaluated such reports and that the MHT organization take the necessary steps to inform the persons tested of the need to make arrangements with a physician for their evaluation and follow-up care if required.
3. However, it is recommended that the physician evaluate any MHT reports involving patients whom he is actively treating or has treated in the past and that he communicate with such patients, especially if treatment or further testing is advisable. Failure to do so possibly may result in liability for malpractice if as a consequence the patient is not provided with prompt necessary treatment.
4. Even though the person involved is a stranger to the physician, if the testing results for a particular person indicate an urgent and immediate need for medical treatment suggesting a possible emergency situation, it is recommended that the physician communicate directly with the patient without delay for humanitarian reasons.

#### b. Ethical

Multiphasic health testing programs should adhere to the Principles of Medical Ethics. The Judicial Council of the American Medical Association has reviewed the ethical aspects of the operation of MHT programs and the use of test results. Among the statements made by the Judicial Council are:

"An attending physician may not receive a rebate, referral fee, commission or the like from a program whose facilities have been used by his patients."





"Neither can an individual who is tested nor a facility which conducts these tests demand that a physician accept an individual as a patient or evaluate these tests for the individual. The physician remains free to choose whom he will serve."

#### IV. OTHER FACTORS TO BE CONSIDERED:

Some problems associated with MHT also must be understood. Some of these limitations are: (1) false positives and false negatives on test results; (2) depersonalization of health care; (3) misconception by some users that MHT is a complete diagnostic procedure that replaces the need for periodic examinations by physicians; (4) many abnormalities appearing in the test results were known before or suspected; (5) possible overload on the health delivery system by identification of abnormal or questionable findings.

It must be realized that there is the potential for increasing the cost of health care by detection additional disease and conditions that require follow-up evaluation. This would likely result in an increased demand on the delivery system.

Accurate cost benefit analysis has been difficult because of many complex variables. Research must be pursued in order to determine properly and accurately the cost benefits and to assess the true yield of the multiple tests in terms of disease processes that can be corrected or interrupted. This is necessary to determine the proper role for MHT in positive health maintenance and preventive medicine.





## APPENDIX B: SAMPLE QUESTIONNAIRE AND COVER LETTER

Please indicate your response by checking the appropriate

column:	<u>YES</u>	<u>NO</u>
1. Are you familiar with multiphasic screening? ( )	( )	( )
2. Have you ever referred a patient to a screening facility? ( )	( )	( )
3. Do you think that the concept of automated multiphasic screening, utilized in conjunction with a computer, is a significant innovation in medicine? ( )	( )	( )
4. Do you think that a properly designed screening program could be used as an entry mechanism for "primary care"? ( )	( )	( )
5. Would you use a screening facility if it were available to you? ( )	( )	( )
6. Do you think that multiphasic screening should be used at Armed Forces Examining Centers and at other activities that perform a large number of physical examinations? ( )	( )	( )
7. If multiphasic screening was available at Naval Facilities, which of the following do you think should be made a part of the regimen of tests or functions of a screening facility:		
a. Screen all new patients reporting for primary care. ( )	( )	( )
b. Screen patients reporting for physical exams only. ( )	( )	( )
c. Take detailed patient histories. ( )	( )	( )
d. Perform a standard set of lab tests on all patients. ( )	( )	( )
e. Perform only the lab test ordered for each individual patient. ( )	( )	( )
f. Monitor the health status of chronically ill patients. ( )	( )	( )



	<u>YES</u>	<u>NO</u>
g. Based upon an internal data bank, provide computer determined probabilities of certain conditions being present (computer assisted diagnosis).	( )	( )
h. Prescribe a recommended therapeutic regimen for the physicians' review and concurrence.	( )	( )
8. Do you think the following factors have a direct influence on a physician's acceptance or rejection of multiphasic screening/testing? Circle the three that you believe to be most influential.		
a. Exposure to the concept in Medical School.	( )	( )
b. Peer group recommendation.	( )	( )
c. Being allowed to participate in the planning of a facility.	( )	( )
d. Personal involvement in the operation of a facility.	( )	( )
e. Management style of the operators of the screening facility which the physician has contact.	( )	( )
f. Exposure by reading in medical periodicals.	( )	( )
g. Standardization of procedures and records	( )	( )
9. Would you recommend installation of multiphasic screening facilities at all Naval Hospitals?	( )	( )

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



PERSONAL DATA:

Age \_\_\_\_\_

Sex \_\_\_\_\_

Rank \_\_\_\_\_

Orthopedic \_\_\_\_\_ OB-GYN \_\_\_\_\_

Internal Med \_\_\_\_\_ Peds \_\_\_\_\_

Psychiatry \_\_\_\_\_ Surgery \_\_\_\_\_

Radiology \_\_\_\_\_ G.P. \_\_\_\_\_

CURRENT STATUS

Intern \_\_\_\_\_ Board eligible or  
certified \_\_\_\_\_

Resident \_\_\_\_\_

General Medical Officer \_\_\_\_\_

Other \_\_\_\_\_  
(please specify)



Dear Doctor:

As part of a student's research project being conducted at the Naval Postgraduate School, Monterey, California, a survey of Navy Physicians' attitudes toward Multiphasic Screening/Testing is being made. The enclosed brief questionnaire is intended to sample the Navy Physician Community for the purposes of:

Assessing the current level of physician familiarity, use, and acceptance of multiphasic screening.

Determining the preferred regimen of tests or functions of a screening program.

Determining some of the factors which have a direct influence on a physician's acceptance or rejection of multiphasic screening.

The Postgraduate School does not desire to impose an administrative burden on any person or activity; however, response to the enclosed questionnaire, while providing data for an academic project, may also produce information leading to an evaluation of the role of multiphasic screening in the Navy Health Care Delivery System.

It is requested that the enclosed questionnaire be completed and returned prior to 10 December 1974. A self-addressed envelope is enclosed for your convenience. Signatures are not required as individual responders will not be identified in the project. Your cooperation in this project is deeply appreciated.

Sincerely,

/s/  
JAMES A. JOLLY, Ph.D.  
Professor





## APPENDIX C: SURVEY COMMENTS

The following comments were received from the Navy Physician Opinion Survey: (Given in the order that the questionnaires were returned).

1. In my opinion multiphasic testing has yet to prove itself time or cost effective.
2. Too expensive. Money could be better spent on more necessary items. Would be useful in certain select situations.
3. I cannot give objective answers with no knowledge of the program.
4. The cost savings of doing screening is large and the information cuts down many clinic trips for piecemeal evaluations.
5. Who will pay -- and pay -- and pay?
6. My limited experience with MS as an internist has been in correcting misconceptions and errors generated by mindless all-encompassing screening. The only way this concept will survive is if a physician's income is restricted by his failure to participate, or conversely, if federal restrictions make private practice so onerous that establishment of private facilities to provide multiphasic study allows escape (CF, NHS in England) from bureaucratic regulation etc.
7. It is about time the Navy caught up with the latest state of the art in medicine.
8. If economically feasible.
9. Preferably at the Regional Medical Centers.
10. I think it has great possibilities.
11. I know nothing about it.
12. Only large facilities, greater than 400-500 beds.
13. Standardization and institution of a large data base is extremely important in providing efficient health care. The completeness of the data base precludes physicians from obtaining this on an individual basis.
14. Absolutely! As principal investigator of the U.S. Navy longitudinal Health Study for Submarines and Divers at the



Submarine Base New London, I have strong feelings that such a program is long overdue in Navy Medicine.

15. Increases patient handling capacity.

16. Not familiar with concept enough to answer questions.

17. Not at this point. I think that this is the kind of innovation that would lend itself to laboratory study before universal installation. Effectiveness, economy, and other aspects of assessment in health care programs should be determined in such a feasibility study.

18. Not at present, with the possibility of the service losing care of the retired population.

19. No. Military medicine is abusive. Patients are excessively disease oriented, especially retirees who see hospitals as a contact with their old way of life. Such screening would only increase reinforcement of this psycho-social pathology and perpetuate a care system where 10% of the population consumes 90% of medical care, and mostly without indication.

20. No. With one qualification (exception). A limited program should be available in areas that are poorly or understaffed with specialists or where the primary care population is so large that pushing people too rapidly through ordinary physicians or physicians screeners is a chronic problem.

21. I am not familiar with the concept.

22. Trial at large facility for 1-3 years first.

23. Major teaching hospitals only.

24. Follow-up of chronic illness such as COPD, Hypertension, Diabetes Mellitus, etc. would be aided by a regularly scheduled multiphasic screen. The use of a "screen" for regular evaluation of all adults over 35 years of age would also be helpful as they are often only seen in "walk-in clinics."

25. Although I feel multiphasic screening/testing (automated) has a role in "Modern Medicine" insofar as a data gathering and compiling service is concerned, I feel that the patient history must still be taken by medical or paramedical personnel. For this reason, I feel that these programs should be started only where there are sufficient personnel to fulfill this function.

26. I feel that this should be substituted for routine annual physical examinations. Much time is wasted in this area for little benefit.

27. Not at this time. Too new to accept universally.



28. It would be inadvisable to install such equipment without a pilot program assessment.
29. I feel multiphasic screening is a waste of time on all patients. It is a waste of money in respect to paperwork and operator expense for results obtained.
30. Initial testing with publication of results should precede installation in the Naval Service.
31. Sounds expensive.
32. These facilities should be located at Regional Medical Centers -- not at all Naval Hospitals.
33. Only at large facilities.
34. Use is definitely patient age related.
35. Yes, it would have a multifold effect on health care delivery by (1) bringing to light those areas skipped over in physicians patient interviews, (2) would end "Doctor Bias," (3) broaden learning experiences, and (4) expedite judicious medical management.
36. I feel that the tests are too standardized for acute care patients, and perhaps they are for all patients, although I'm in favor of a trial of the concepts effectiveness. Unfortunately, words have nuances and near different meanings to different people. This is where a standardized computer system falls down because wrong conclusions can be drawn from what the patient says rather than what he means.
37. Most hospitalized patients have routine multiphasic type lab work done already, as do patients reporting to Internal Medicine Clinic. I think screening/testing would be better done at AFEES to prevent enlistment of chronically ill or subclinical conditions.
38. I've not seen any useful application of computers to general medicine. I think general screening would have a low yield at high cost. I don't know specifically what is meant by multiphasic screening or testing. So most of the above answers represent nothing more than personal, uneducated bias.
39. No. Care at Naval Clinics and Hospitals is episodic rather than comprehensive, with accent on quantity and cost effectiveness, rather than quality, and administered by untrained administrators generally unsympathetic to patient oriented management.
40. What is it?





41. If cost is favorable, ok.
42. I don't know enough about it yet to make a recommendation.
43. Yes, I am for it, providing that we do not screen those under 35-40 years of age because there will be too many negative results.
44. I doubt that the efficiency of multiphasic screening/testing could ever be incorporated into the Navy System because of the Navy's inherent inefficiency. Also it would certainly be abused by the patient population which the Navy serves.
45. Multiphasic screening/testing is applicable to Naval Hospitals if properly administered according to age, service time, permanency of residence. It should not be applied to all personnel reporting for primary care and by the same token, should not be restricted to personnel reporting for physical exams.
46. I have not encountered even the definition of multiphasic screening and so I do not understand what it entails.
47. The expense would probably be too great to make it practical.
48. Should be on an all or nothing basis with interconnection throughout the military services so that data could be available to all facilities. Wouldn't be a bad idea if all government medical facilities could be interconnected.
49. Insufficient information on the subject to make a positive recommendation.
50. I am a strong proponent of ADP for data base gathering, but reject the implications of questions 7g and 7h as disastrous in the long run.
51. I question AMHT (Automated Multiphasic Health Testing) usefulness in evaluation of infants and young children. My experience indicates good utilization in adult patients.
52. Poor questionnaire!!! [Note: respondent, a LT, Board Certified Anesthesiologist, also answered no to all questions.]
53. MPS is useful in only selected patients and can represent a huge increase in health care cost if used indiscriminently. Also a computer which standardizes indicated treatment reduces a physician to a technician (less decision making than an Independent Duty Corpsman) and make him liable for malpractice if he should deviate from the computer norm.
54. Many military facilities are presently overwhelmed with out-patients with minor complaints. I feel that multiphasic





screening offers its greatest potential in facilitating the entry of such patients into the health care system. It is nice to note that at least one Naval activity is interested in what the physician in the field has to say about subjects of current interest. Thanks for including me in your survey.

55. Not all patients will be in need of MPS. Various physicians will require MPS to different degrees. Collecting the same data on different patients is unnecessary. Utilizing MPS as a selective data base of individual patients to assist in a diagnosis and following a patient's illness are the primary uses of MPS -- as I see it.

56. NARMC Pensacola currently has the rudiments of such a system -- although not tied to a computer at this point. We are doing a battery of evaluations (x-rays, blood, urine, pulse, EGG, etc.) appropriate to the patients status or in connection with physician assistants done physicals. We also take referrals from MD's in family practice, etc. for physical testing and do work only to be used by them as a data base in connection with their exams of patients.

57. A. The future of computers in medicine is obvious.

B. It cannot replace the physician, nor replace the patient/doctor relationship.

C. It is a tool that can broaden the scope and abilities of every single M.D.

58. Sounds like a good apparatus for medical centers and possibly dispensaries that perform many physicals.

59. As a computer-oriented physician (IBM Systems Engineer in past), I strongly recommend this concept. However, keep in mind cost justification and relevance for small dispensaries and hospitals.

60. I wouldn't spend a dime for such "niceties" until there is an adequate number of physicians.

61. I know nothing about multiphasic screening or testing and thus cannot comment intelligently.

62. It is another high price tag which tries (unsuccessfully) to direct the already limited thought processes involved in the health care of many service personnel. Use the money to pay for better quality physicians.

63. Multiphasic testing is an adjunct to medical practice, not a replacement for medical practice which involves the art as well as the science of medicine.

64. It could replace the "routine" physical exam by the physician and also direct the physician to possible problems that would not be recognized otherwise. It will also allow the physician more time to study problems and less time on routine history and lab work.



65. More details should have been provided on what is involved in multiphasic screening/testing.

66. I think that a small number of tests should be available to all facilities where results could be returned in 3-4 days. I feel that only the Regional Medical Centers need to have the large battery available.

67. Multiphasic screening/testing would be a great help in providing better preventive care to all we see.

68. These questions are not specific enough to answer. Multiphasic screening programs are typically not adjusted properly to the defined population and as such waste money and time. A properly designed program, flexible enough to do the right tests for the right patient is a useful thing.

69. I would recommend the installation referred to in question #9 simply because it would be a partial solution to the primary care problem in a specialist oriented medical care system, not because it has any special merit over adequately staffed primary care clinics.

70. Sorry about the lack of answers, but I am not at all familiar with what you mean by multiphasic screening/testing.

71. If facilities are large enough to make full use of computer time.

72. I am entirely unfamiliar with the concept. It sounds dreadful though, in terms of the questions asked about it.

73. I am not familiar with the precise details of this concept. Therefore, I cannot comment.

74. Cost/benefit ratio would be good only for large numbers of patients -- not at tiny hospitals.

75. Multiphasic screening is important but cost would require placement at Regional Medical Centers only, where workload would justify its existence. It should be used to correlate data and substantiate diagnosis made by careful history and physical exam. It is not a substitute for the above nor can it be a fountain head for diagnostic information. It can indeed, lead to erroneous diagnoses if not correlated with clinical findings and history as given by the patient.

76. Something should be done to stop the ridiculous abuse by DEPENDENTS at the Navy Health Care Facilities. They, have no financial or work responsibility and therefore over-use everything -- especially emergency care facilities.

77. This could be a good "physician-extender."

78. At large facilities only.



79. I think a well planned screening program would be efficient in high volume clinics. It would be necessary to exercise extreme care that too much faith not be placed by the individual physician on a rigid program. He should use the same subjectivity he would use in interpreting laboratory results.
80. Might possibly not be economically feasible for smaller Naval Hospitals.
81. Sorry, but I don't have any idea of what you are asking.
82. Installation should be accomplished at the Naval Hospitals seeing the most number of dependents and chronic care cases. Since the bulk of active duty personnel are in fairly good health, it would not be justified at all activities.
83. A data base would help immensely to facilitate care (out-patient) in the current hodge-podge spotty crisis oriented Navy system, if coupled with a mechanism for utilization of the information obtained.
84. I cannot make a recommendation as I have not personally seen one operate. If it would develop a good data base, then I would agree. If it were a red tape, more time than worth operation, then I would reject the system.
85. I think multiphasic screening is an important aspect of medical care. However, I believe that it is tremendously abused and could not be performed as a routine screening procedure for every patient who walks into a medical facility.
86. (1) Major consideration would be cost. (2) I don't believe that it will be cost effective for several years.
87. I would recommend family practice clinics with each person in a family assigned to his/her own doctor, like at Jacksonville. I recommend expansion of Navy Medical Care, abolition of CHAMPUS and total medical care of beneficiaries being provided in the military setting. Multiphasic screening must not take away or be a substitute for direct physician contact.
88. I really do not know the capabilities of such a system, but I am now interested in reviewing available data on the subject.
89. Much physician time in the walk-in clinics is wasted by people with functional complaints, wondering if they are anemic etc., and the availability of such test would speed the screening and allow more time for counseling and treatment of any organic disease. It is better to R/O false positives with further tests and clinical exam than to miss conditions such as renal disease or cancer or hypertension, etc. which if found early could be treated or managed as a outpatient in





order possibly to delay or prevent end stages requiring expensive hospitalization.





## BIBLIOGRAPHY

- 1971 "A Review of AMHT Centers." Hospitals 45(March): 75-87.
- Adams, Anothy I.  
1968 "Who is Worth Screening and for What." Medical Journal of Australia 2(November):860-3.
- American Medical Association.  
1972 Statement on Multiphasic Health Testing. Chicago: American Medical Association.
- Banks, William B.  
1971 "Multiphasic Health Testing -- An Entry to Primary Care." p. 1-11 in Automated Multiphasic Health Testing: A Health Services R & D Laboratory. Washington, D. C.: U.S. Government Printing Office.
- Bates, Barbara and Josph Mulinare.  
1970 "Physicians' Use and Opinions of Screening Test in Ambulatory Practice." Journal of the American Medical Association 214(December):2173-80.
- Bates, Barbara and Joel A. Yellin.  
1972 "The Yield of Multiphasic Screening." Journal of the American Medical Association 22(October):74-8.
- Beach, Dale S. (2nd ed.)  
Personnel: The Management of People at Work. New York: The Macmillan Company.
- Breslo, L.  
1959 "Periodic Health Examinations and Multiple Screening." American Journal of Public Health 29 (September): 1148-56.
- Chapman, William E., III.  
1970 "Electronics in Medical Practice: Automated Multi-test Facilities." Postgraduate Medicine 148(August): 42-3.
- Collen, Morris F.  
1966 "Periodic Examinations Using an Automated Multitest Laboratory." Journal of the American Medical Association 195(March):142-5.
- Collings, G. H., Jr., B. F. Levy, K. L. Stratton, and L. W. Wood.  
1972 "Follow-up on MHS." Journal of Occupational Medicine 14(June):462-5.



- Craig, James L.  
1972 "Health Care Delivery System of the Tennessee Valley Authority." Medical Progress Through Technology 1(March):15-25.
- Dale, Ernest (2nd ed.)  
Management: Theory and Practice. New York: McGraw-Hill.
- Feldman, Robert and Stephen Lee Taller.  
1973 "Multiphasic Screening." Journal of the American Medical Association 223(January):559-60.
- Flynn, E. D., Ph.D.  
1969 "Barriers to Utilization of Multiphasic Screening." Journal of Occupational Medicine 7(July):233-5.
- Freeborn, Donald K. and Benjamin J. Darsky.  
1974 "A Study of the Power Structure of the Medical Community" Medical Care 12(January):1-12.
- Garfield, Sidney R.  
1970 "Multiphasic Health Testing and Medical Care as a Right." The New England Journal of Medicine 283 (November):1087-9.
- Garfield, Sidney R.  
1972 "Multiphasic Testing." Medical Progress Through Technology 1(March):2-6.
- Gelman, Anna C.  
1970 "Automated Multiphasic Health Testing." Public Health Reports 85(April):361-73.
- Giere, W., G. Kanzler and F. Schopl.  
1972 "Health Testing at the Deutsche Klinik fur Diagnostik (German Diagnostic Clinic)." Medical Progress Through Technology 1(March):35-44.
- Gitman, Leo.  
1971 "AMHT The Sociological Implications." Hospitals 45(March):63-8.
- Gleser, Malcolm A. and Morris F. Collen.  
1972 "Towards Automated Medical Decisions." Computers and Biomedical Research 5(April):492-6.
- Hecker, Robert.  
1972 "The Investigation of the Patient: Modern Developments Including Automated Multiphasic Health Screening and the Use of Computers in Medicine." Medical Journal of Australia 2(August):492-6.



- Holland, Bryan O.  
 1971 "Disease Detection by Automated Multiphasic Health Testing." p. 88-101 in Automated Multiphasic Health Testing: A Health Services R & D Laboratory. Washington, D. C.: U.S. Government Printing Office.
- Horrocks, Jance C., A. P. McCann, J. R. Staniland, D. J. Leoper and F. T. Dombol.  
 1972 "Computer Aided Diagnosis: Description of an Adoptable System, and Operational Experience with 2,034 Cases." British Medical Journal 5804(April):5-9.
- Hsieh, Richard K.  
 1971 "An Automated Multiphasic Health Testing Center." p. 12-26 in Automated Multiphasic Health Testing: A Health Services R & D Laboratory. Washington, D.C.: U.S. Government Printing Office.
- Janner, I. F.  
 1971 "The Programmed Physical Examination With or Without a Computer." Journal of the American Medical Association 215(February):1281-5.
- Khoury, Sami A.  
 1972 "Multiphasic Screening in Washington, D. C., 1968 and 1969 Results." Health Services Reports 87 (August-September):664-8.
- Kobayoshi, Tohni, Yutake Morigama and Yoshisuka Iwai.  
 1972 "Health Test Systems in Japan." Medical Progress Through Technology 1(March):26-34.
- Koontz, Harold and Cyril O'Donnell (5th ed.)  
 Principles of Management: An Analysis of Managerial Functions. New York: McGraw-Hill.
- Mechanic, David.  
 1970 "Factors Affecting the Acceptance of Automated Multiphasic Health Testing and Services Among Consumers and Providers." p. 235-41 in Automated Multiphasic Health Testing and Services, Vol. 3. Washington, D. C.: U.S. Government Printing Office.
- McElroy, Jerome F.  
 1972 "A Health Testing System by Private Enterprise in Canada." Medical Progress Through Technology 1 (March):7-13.
- McWhorter, C. A.  
 1968 "Multiphasic Health Screening Examinations," Hospital Progress 49(June):34.  
 1970 "Multiphasic Health Screening -- A Fad, A Gimmick, or the Significant Innovation." Group Practice (March):7-9.





- 1971 "Multiphasic Testing: How Some Doctors Have Learned to Stop Worrying and Work with the Machine -- While Others Have Not." Medical World News 12(October): 51-62.
- 1972 "Multiphasic Test and the Doctor." Medical World News 13(March):59.
- 1972 "Now: Jiffy Multiphasic Screening, Impersonal Method Cheap, Fast, But Some Doctors Doubtful." Medical World News 13(June):20-1.
- Oszustowics, Richard J.  
1972 "Now Just Tell the Computer What Ails You." Modern Hospital (September):83-9.
- Rawson, Graeme.  
1972 "Multiphasic Screening -- Definition and Assessment." The Medical Journal of Australia 2(August):497-504.
- Sanazaro, Paul J.  
1971 "AMHT-Definition of the Concept." Hospitals 45 (March): 41-3.
- Schwartz, William B.  
1970 "Medicine and The Computer: The Promise and Problems of Change." The New England Journal of Medicine 283 (December):1257-70.
- Scott, M. R. and W. S. Frederik.  
1972 "Electronic Data Processing (EDP) and Multiphasic Health Screening." Journal of Occupational Medicine 14(June):457-61.
- Searle Medida, Inc.  
1974 Searle Medidata Automated Multiphasic Health Testing Systems. Waltham, Massachusetts: (Vender Advertisement).
- Smillie, W. G.  
1952 "Multiple Screening." American Journal of Public Health 42(March):255-8.
- Smith, Phillip A.  
1961 "Computers in Behavioral Science." Behavioral Science 6:88-91.
- Spencer, Vernon, James Snyder and Robert W. Ewer.  
1970 "Automated Multiphasic Health Testing: Several Hospitals Already Have It...Should Yours?" Hospital Management 110(July):14-21.
- Startsman, Terry S. and Robert E. Robinson  
1972 "The Attitudes of Medical and Paramedical Personnel Towards Computers." Computers and Biomedical Research 5(June):218-27.





- Tabershaw, Irving R.  
1972 "A Unique, Functional, and Progressive MHS Program." *Journal of Occupational Medicine* 14(June):433.
- Turner, Robert J.  
1971 "Acceptance of Multiphasic Screening: An Individual Decision." *Medical Opinion*:76-9.
- U.S. Department of Defense  
1971 Systems Analysis for a "New Generation of Military Hospitals." Final Report to the Advanced Research Projects Agency, by Arthur D. Little, Inc., Vols. 1-8.
- U.S. Department of Health, Education and Welfare.  
1970 Automated Multiphasic Health Testing: Bibliography, Vol. 1, Washington, D. C.: Government Printing Office (PHS Publication No. 2076).
- U.S. Department of Health, Education and Welfare.  
1970 Provisional Guidelines for Automated Multiphasic Health Testing and Services, (Vol. 2-Operational Principles -- Report of the AMHTS Advisory Committee to the National Center for Health Services Research and Development). Washington, D. C.: Government Printing Office.
- U.S. Department of Health, Education and Welfare.  
1970 Provisional Guidelines for Automated Multiphasic Health Testing and Services, (Vol. 3 - Proceedings of the Invitational Conference of AMHTS). Washington, D.C.: Government Printing Office.
- Von Oeyen, Paul.  
1972 "Opinions of Rhode Island Physicians on Automated Multiphasic Screening." *Health Services Reports* 87(April):366-74.
- Watson, Walter J.  
1969 "The Physician's Role in Multiphasic Testing." *Journal of Occupational Medicine* 11(June):458-62.
- Watts, Malcolm.  
1970 "AMHTS and the Health Care System." p. 3-9 in H.E.W. Provisional Guidelines for Automated Multiphasic Testing and Services. Washington, D. C.: Government Printing Office.
- Westwood, Sandra F.  
1973 "The Future of Automated Multiphasic Screening." *Medical World News* (January):32-8.
- Williamson, J. W., M. Alexander, and G. E. Miller.  
1967 "Continuing Education and Patient Care Research: Physician Response to Screening and Test Results." *Journal of the American Medical Association* 201 (September):938-42.



Wright, P. G.

1971 "The Implications of Automated Health Screening for Delivery of Medical Care." Community Health (Bristol), 2(September):71-80.

Yedidia, Avram, M. A. Bunow and Michael S. Mudavinh.

1971 "Computerized Entry into Medical Care -- Its Impact on Doctor-Patient Relationships." California Medicine 115(October):69-73.



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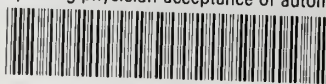
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